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MARKETDATA ENTERPRISES

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THE U.S. COMPUTER PRINTER & PLOTTER MARKET

(A Strategic Marketing & Economic Analysis)

This report has been prepared by using a comprehensive variety of "secondary" sources, including trade associations and journals, computer databases, financial and other directories, special surveys and articles, manufacturers' literature, Government Census statistics, as well as "primary" research-phone surveys by Marketdata.

The report is equally applicable to: U.S. or foreign computer printer/plotter manufacturers, distributors, industry analysts, brokerage firms, consultants, banks, or acquisitions candidates.

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THE U.S COMPUTER PRINTER & PLOTTER MARKET
(FEBRUARY 1988)

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INTRODUCTION AND STUDY METHODOLOGY

Marketdata has prepared the following business information report with the manufacturer, distributor/retailer, consultant, merger/acquisition candidate, and industry analyst in mind. Only the most pertinent and up-to-date information about computer printers and plotters has been used. The study covers marketing, economic, technological, and financial aspects, and draws upon a wide variety of public and private sector information sources.

The reader will be able to utilize this report as a comprehensive planning and analytical tool, gaining insight into the industry's past, current and projected performance, growth, structure, strengths and challenges. Information is both **qualitative** and **quantitative**, and will be useful for the long-established manufacturer as well as first-time analyst.

The Bureau of the Census and U.S. Department of Commerce classify industrial (as well as retail, wholesale and service) sectors of the economy by SIC (Standard Industrial Classification) codes. The production of computer printers and plotters is **not** considered an **industry** in itself. Rather, it is a specific **segment** of the total computer manufacturing industry, classifed as computer "input/output" or peripheral equipment.

Therefore, the "economic" ratios provided in the industry economic structure section pertain mostly to computer manufacturing plants **overall.** However, printers and plotters are one of the main product lines manufactured in these plants. Government data for these plants is classified under SIC code 3753 (Electronic Computing Equipment).

In the reports Market section, computer **printers, plotters, and teleprinters** sales data (dollars and units) was obtained from annual editions of the Commerce Department's Current Industrial Report MA 35R (Computers, Office & Accounting Machines). **Printers** data is classified under the 7-digit SIC codes 35732 42-47. **Plotters** data is classified under SIC 35732 70. **Teleprinters** data is classified under SIC 35732 75-78.

Sales figures in the Market section are based on these Government surveys, and represent **sales at the MANUFACTURING/PRODUCER level**--value as it leaves the factory. Final price or value at retail or wholesale levels will be higher, as mark-ups are incorporated that reflect value-added services. Therefore, estimates of market size from trade journals, industry analysts, and other research firms may be substantially **higher** than these Government figures (see Computer Abstracts section).

Marketdata strives to consult as many sources as possible, to arrive at a "consensus" figure for market size and forecasted growth. To rely on just **one or several** sources can be very misleading and inaccurate.

The following information sources were used for this report...........

- * Current Industrial Reports (annual editions-Computers & Office Equipment- MA 35R)
- * Annual Survey of Manufactures (annual editions, Dept. of Commerce)
- * 1982/1977 Census of Manufactures (quinennial, Bureau of the Census)
- * 1982 Census of Service Industries (quinennial, Bureau of the Census)
- * Dept. of Commerce, County Business Patterns (1985)
- * Dun & Bradstreet 1987 Million Dollar Directory
- * Standard & Poors and Moody's directories, stock sheets, industry surveys
- * Value Line Investment Survey
- * Manufacturers' product catalogs and advertisements
- * Computer industry Trade Associations
- * Dialog/Lockheed Predicast Database--U.S. Forecasts file
- * Trade Journals/Magazines: Electronics, Electronic News, Personal Computing, MacWorld, MacUser, Business Week, the Wall St. Journal, etc. (and their editorial staffs)
- * Marketdata proprietary files and databases
- * Special reports/surveys by various consulting/research organizations (Datapro Research Corp.)
- * Electronics Buyers News 1986 Handbook & Directory
- * Robert Morris Associates-Annual Financial Statement Studies
- * National Yellow Pages directories

EXECUTIVE OVERVIEW AND MARKET OUTLOOK

Roughly two years ago, early in 1986, computer printer makers faced red ink, sagging profits, layoffs and cutbacks. Overcapacity was most pronounced in printers priced under $2,000. As one moved up the price scale, the competition thinned. Much of the strong gains achieved in 1984 were due to heady sales of personal computers, to which many printer sales were closely tied. Most vendors failed to distinguish themselves in terms of product differentiation. The rumblings of market consolidation that began with the Dataproducts and Printronix acquisitions in 1983 continued in 1986 as Genicom acquired Centronics. Some things have changed since 1984 and 1986--some have not.

Overcapacity, fierce competition for market share, falling prices and slim profit margins are still present today. Japanese competition predictably has grown more intense, mostly at the low end, but the yen-dollar relationship has forced Japanese firms to work toward greater price stabilization. There is still great emphasis on the PC market, as users shift to distributed processing where networking requires a larger number of workstations (with a corresponding increase in printers). Indeed, much of the growth of the printer market during 1987 stemmed from a strong rebound of the PC market, spurred by new product introductions by Apple (Macintosh) and IBM (Personal System 2).

For 1987, 1988 and beyond, market growth has been and will be very product-dependent. The coming years will be characterized by a renewed interest in features, rather than just price. Connectivity will become more important. Printers are shared extensively in a variety of environments, and need to operate invisibly to multiple users with multiple uses, in multiple systems. There will be more printer vendors working together with software developers, systems manufacturers, and an army of value-added resellers to address specific applications and their correspondingly higher margins.

Fragile margins are forcing computer specialty resellers to abandon their "high volume commodity" mentality in favor of "solution sales". Printer makers will have to recognize these shifts in their reseller ranks and remain responsive through new support programs, pricing strategies, and marketing policies. Service and support should not be ignored as potential revenue sources, especially in the non-impact area, where reliability is still perceived as a problem.

Further industry consolidation may become a more common occurrance, and possibly a strategy or remedy as the non-impact segment grows. This technology is generally beyond the R & D capabilities of all but the largest firms. In fact, the October 1984 edition of Marketdata's Computer Printer Market report listed over 230 vendors in the market. But, this had fallen to 192 by April of 1986, and is undoubtedly lower now.

Printer technologies now overlap one another: page printers compete with line printers at the high end and with daisywheels at the low end, near letter-quality dot matrix models compete for word processing markets, and non-impact technologies have made inroads at the expense of impact technologies.

There seems to be no clear consensus as to the **exact** size of the computer printer market. Estimates of market size vary wildly, depending on which market research house one consults. For example, Dataquest puts the market at $4.7 billion for 1987, while Electronics magazine estimates $7 billion for 1986 and Datek Information Services says $7.7 billion in 1986. The Datapro Research Corp. estimates $4.2 billion for 1986. Which is the most accurate, and how are they defined ?

Marketdata feels that it is best to start with the fundamentals--official **government** trade statisitcs reported in terms of **factory shipments by U.S. manufacturers, plus imports** entering the country. During 1986, U.S. producers' sales were valued at $2.17 billion, and 878,000 units. In that year, $1.73 billion worth of "imports for consumption" entered the U.S., and 4,689,000 units. **Imports represented 49% of the dollar value of the market, and 88% of the units in 1986.** That makes the market worth $3.9 billion at the manufacturer level, **before** distributor/retailer/reseller mark-ups. Based on these figures, and a consensus of growth estimates by: Marketdata, the major trade journals, and other market research firms, following are our estimates of the printer market--**before** distributor mark-ups are added--through 1995.......

	1986	1987	1988 E	1995 F
U.S. Mfrs. Sales ($ bill.)	$2.17	$2.48	$2.72	$4.78
Imports	1.73	2.01	2.19	4.12
Total Market:	3.90	4.49	4.91	8.90

Non-impact printers will gain in their percentage of the total market, while impact units fall. The following are Marketdata's estimates for these shares, from 1986-1995..........

Share of Total Market (%)	1986	1987	1988 E	1995 F
Impact Printers	64.3	58.9	55.2	42.0
Non-impact Printers	35.7	41.1	44.9	58.0

The computer **Plotter** market is much smaller, estimated to be only 5% of the value of the printer market. The vendor list is much smaller, about 20 companies. Computer plotter sales by U.S. manufacturers totalled $477.8 million during 1986, according to the Department of Commerce. We estimate this figure to have risen 19% to **$569 million in 1987 and to increase 14.6% in the current year, to $652 million. Through 1995, we expect 8.1% average annual gains, to $1.022 billion.** Over 137,500 units were shipped in 1986, a volume expected to have risen to 158,000 in 1987, estimated to rise to 176,000 in 1988, and forecast to reach 218,000+ by 1995.

Nearly 66% of the plotter **units** shipped in 1986 were at the low end (less than $500 to $2,500), but 78% of the **dollar** volume was accounted for by units with price tags of $2,500-15,000 or more.

Printers and plotters **combined** represented 15.7% of total computer peripheral equipment sales during 1986. Peripheral equipment shipments totalled $16.88 billion. We expect this share to have risen to 16.2% in 1987, 16.8% in the current year, and 17.4% by 1995. By comparison, Datapro Research estimates that computer printers represented more than 25% of all peripherals sales in 1986.

Teleprinters are a "hybrid" of a CRT and a printer, considered as a type of general purpose computer (interactive terminal with a hard-copy printer). As such, we consider them as part of the overall printer market, but not a true stand-alone printer device.

U.S. producers sold nearly $482 million of these teleprinters during 1986, up 9.2% over 1985. Over 376,000 units were shipped. The bulk of the growth in this market took place during 1980-82. Growth rates have slowed considerably since then, with competition from the proliferation of new, low-cost stand-alone printers. Teleprinters are usually classified by CPS (characters per second) speeds of: under 100 CPS, 100-200, and 200+ CPS.

We estimate that teleprinter sales increased 6.3% (in dollars and units) during 1987, to $512 million and 400,000. For 1988, with the general rebound in computer sales, we expect sales to be up 12.5%, to $576 million (and 450,000 units). Further out, to 1995, we expect annual growth a little under 4% (average yearly), to $732 million.

According to Personal Computing magazine (Fall 1987), there are now at least 44 companies making laser printers, offering at least 84 different models to the U.S. market. Correspondingly, there are 44 companies producing desktop publishing software--the hottest new development regarding in-house typesetting and graphics work that used to be farmed out, especially by small businesses.

As laser printer prices fall to reasonable levels ($1,500-2,000 range now), while performance **increases**, they are gaining widespread acceptance in office use. This price decline is permitting the laser printer market to expand beyond merely graphics-specific applications. Such large corporations as Montgomery Ward, K-Mart, Mutual of Omaha, and Continental Illinois Bank are replacing multiple dot matrix printers with single laser printers, geared to typical data processing tasks.

Laser printer manufacturers also are pushing **color** capabilities--but the quality has yet to reach acceptable levels for many desktop publishers. Users are questioning whether they really **need** color, and generally are not willing to spend more than 20% more than black & white for it. One consulting firm estimates that color printers now account for 8% of total printer unit sales and 5% of revenues.

It has been estimated that Hewlett-Packard controlled about 69% of the laser printer market in 1986, with Apple capturing about 28%. Japanese suppliers have competed most aggressively at the low-end/price side of the computer printer market, with U.S. makers in a stronger position with laser printers. As prices decline, and Japanese firms move up the "learning curve", competition in laser models will undoubtedly increase in the future. The April 1987 European Economic Community's investigation of Japanese dumping of computer printers centered upon dot matrix and daisywheel models, not laser printers.

Regarding **desktop publishing**, **Page Description Language** (PDL) is gaining importance as a printer feature. **Postscript** is the most widely used PDL on the market now, has gained the support of both IBM and Apple, and is on its way to becoming the industry standard. However, it is a complex language, and many software packages support it only in part. Postscript can increase a typical laser printer's price tag by $2,000, over the limits of what many small businesses can afford.

Due to the great number of manufacturers active in the computer printer market, no one company dominates. The market cannot be characterized as monopolistic or even as an oligopoly--it is very competitive, with many firms capturing small percentages of the total pie. However, there **is** a difference between first and second-tier companies, with the former having greater resources for big R & D/technology investments. Some of the bigger printer firms, and their estimated recent sales, include........

Dataproducts Corp.	$320	million	(1987)
Centronics	216	"	(1985)
Printronix	132	"	(1986)
Qume	115	"	(1985)
Genicom Corp.	114	"	(1986)

Mannesmann Tally Corp. (a German producer) and Epson (which is estimated to capture nealy 31% of the personal computer printer market), as well as Okidata (16% of the PC printer market) and Hewlett-Packard (strong in laser printers and plotters) are other leading manufacturers.

Manufacturers are constantly revamping their product lines, phasing out older models as new technologies render them obsolete. Continuous price-cutting is the norm, which hurts profit margins and especially the smaller firms' ability to survive and grow. Marketing and distribution strategies also undergo continual adjustment, to achieve the most effective penetration of market niches producers attempt to sell to. Sales are made via the following channels: direct from the manufacturer (regional, national, international sales offices), via the 4,500 or so national or regional computer retailers (the six largest chains being: Computer Factory, Inacomp, Businessland, Microage, Entre, and MBI--with combined 1987 sales totalling $423 million), through OEMs, and VARs (value added resellers).

The latter group, **VARs, are becoming a stronger force in computer marketing**. More ties are being forged between them and the large computer printer makers. Dealers are gravitating into two groups--those with sufficient technical and marketing skills to be chosen by producers to handle the most sophisticated new products, and everyone else. Apple and IBM are now "requalifying" dealers to ensure that only the best carry their latest new products. Dealers that **don't** make the grade will compete in high-volume discount business--a virtual guarantee of slim profit margins. This "weeding" out will assure that only the strongest distributors survive--so that consolidation of distributors, as well as printer manufacturers will probably continue in the near future.

As for the **United States** printer manufacturing base, there were 2,016 computer production plants in operation nationwide as of 1985. These are plants that make computers **and** peripheral equipment such as printers--not ones that make printer only. In general, operating costs have risen steadily since 1981, to 75% of each sales dollar by 1985. These plants employed over 384,000 workers, with a typical plant employing about 190 persons. Not surprisingly, California had the greatest number of plants (737 in 1985).

Some market share estimates were made by the U.S. Census Bureau--for "computer peripheral equipment" producers (which includes computer printers and plotters). It is no surprise that, between 1972 and 1982, the share of market captured by the 4 largest peripheral equipment makers fell from 52% to 37%. The share for the top 8 firms dropped from 64% to 54%, for the top 20--from 83% to 71%, and for the top 50--from 94% to 87%. Shares have no doubt fallen further since 1982.

As pointed out in Marketdata's October 1984 report, there are several major trends that will impact upon the computer printer/plotter market in the near future........

1) The "paperless office" is still a long way off. If anything, the increased use of computers has **increased** demand for output devices such as printers.

2) Decentralization of data processing is continuing, with an increase in the number of personal computers, terminals, and networks. PCs are becoming more powerful each year, decreasing the need for reliance on the mainframe or computer center.

3) The formation of new, small businesses, and the era of entrepreneurship remains strong, and will continue at least into the mid-1990s. This is especially apparent in the wake of a tremendous amount of coporate restructurings, staff cut-backs, mergers and acquisitions. Many former mid-level executives are starting their own business, in an attempt to gain greater security and control over their own destiny. Most of these new business owners recognize the value of a small computer system today, and purchase printers as indispensable components of the total system.

4) Periodic "retrenchments" or contractions in this market are unavoidable--the business is not recession-proof by any means. This is based partly on general **economic cycles** that affect consumer and business outlooks and levels of confidence, and partly on **technology cycles** of computer manufacturers. The 1985-86 period was a prime example of this technology/new product phenomena. Potential computer buyers were confused with the proliferation of new products, needed time to "digest" what they bought in recent years, integrating systems into their business, and were waiting for the next round of price cuts and new product introductions. When Apple and IBM came out with their new Macintosh and PS/2 line in the Spring of 1987, much of the speculation abated, and pent-up demand was realized. Consequently, PC sales shot up nearly 20%, and printer sales followed with a 15% gain.

The major difference in the computer printer market since 1984 is that **now the market is much more technology-driven and applications/software-driven.** Printer makers no longer deal in "commodity" products sensitive mostly to price and high volume. They have to forge stronger and closer relationships with computer retailers and software houses that develop new generations of products such as desktop publishing. Like many other markets before it, **U.S.** companies pioneer the bulk of the new technolgies (and hold that edge at the beginning), but ultimately meet aggressive low-end product and price competition from the Japanese as the market matures.

PRINTER TYPES & TECHNOLOGIES

Laser printers produce letter-quality text, and their gains have been at the expense of the **fully-formed character** printers. **Daisywheel** and **thimble** printers had a monopoly on letter-qality print, but they are now being rendered obsolete by low-cost laser printers, especially for high-volume printing. Datapro Research reports that only 12 new daisywheel models and no new thimble models reached the market during the first three quarters of 1986. **Dot matrix** printers handle the low end. There has been a proliferation of near letter-quality, dot matrix printers introduced--over 72 by the end of the third quarter of 1986.

As early as 1983, Japanese printer producers tried to improve print quality by increasing the number of pins in the printhead, from 9 or less to 18 or 24 pins.

Microcomputer printers are either **serial** or **page** printers, because they print one **character** or one **page** at a time. Minicomputer and mainframe computers, however, are classified as **line** printers. Printers can be grouped into two categories: those that strike or impact the paper through a ribbon to produce a printed image, and those that do not. Impact printers can be further divided into two subcategories: those that are typewriter-like and produce a full character image vs. a matrix or grid of dots. Hence, the terms "dot matrix" or "fully formed character" printer. Nonimpact printers, on the other hand, use ink jets, lasers, thermal, and electrosensitive reactions to place images on paper.

Due to the time needed to reposition the printwheel after each character is produced, **fully formed character printers** are relatively slow (12-90 cps). By contrast, some microcomputer dot matrix printers print op tp 600 cps. Fully formed character printers, however, produce characters of the clearest legibility. Printouts from **daisywheel** printers are at least as good as the quality of those from an IBM Selectric typewriter. Fully formed character printers also offer multiple type fonts, including foreign language and scientific fonts.

Manufacturers have recently made significant improvements in print quality, with many dot matrix printers now utilizing such developments as multirowed 24-wire printheads, extremely dense dot matrix capabilities, special ribbons, double and triple passing, etc. In fact, many dot matrix printers produce characters that are difficult to tell apart from typewriter characters.

Dot matrix printers are much more versatile than fully formed character printers, and allow users to selct many different sizes of type and different typefaces, without changing print elements. Graphics capabilities of dot matrix printers are also far superior to fully formed character printers. More and more, manufacturers are enhancing the graphics capabilites of dot matrix printers by incorporating color. Color ribbons have yellow, red, green, and black bands combined on one ribbon. The result is outstanding graphics that make for much more distinctive charts and diagrams. Dot matrix printers are also much faster than fully formed character printers, since they they form all images with the same set of needles.

Laser printing is the fastest-growing area of the printer market. The technology was introduced by Xerox during the early 1970s, and is a direct descendant of xerographic photocopying technology. Like copying, it produces letter-quality hard copies at very high speeds. Laser printers provide substantial advantages over other print methods--they are quiet, fast, and efficient, and print letter-text and clear, crisp graphics.

Publishers have used high-power, standalone laser printers for years in computerized typesetting systems (costing more than $10,000). Only high cost and large size prevented them from being used with **microcomputers**. This all changed in 1984, when Hewlett-Packard introduced the first popular desktop laser printer for microcomputers--the **LaserJet** (initial price of $3,495). It had a speed of eight pages per minute, and resolution of 300 dpi (dots per inch).

However, it was really Canon that developed the desktop laser printer, since the Hewlett-Packard LaserJet uses the printing mechanism, or laser engine, of the Canon LBP-CX printer. Today, Apple, Concept Technologies, Corona, Dataproducts Corp., DEC, Fujitsu America, General Business Technology, Hewlett-Packard, Imagen, Quality Micro Systems, and many less popular producers have introduced products with the Canon engine, reports Datapro Research. Apple was the first to tap the potential of the laser printer, with the **Apple LaserWriter** introduced in 1985.

LED and LCS are two other types of printers (LED-light emitting diode, LCS-liquid crystal shutter). The main advantage of LED and LCS technologies is that they can handle up to 20 pages per minute, and have fewer moving parts than laser printers. **Ion deposition printers** are much faster than other page printers, with speeds up to 90 ppm.

Ink Jet Printers are the most common nonimpact printer, and are very similar to dot matrix units. Droplets of ink are sprayed onto the paper in a specified array. A much more expensive type of ink jet printer is the **continuous-stream ink jet**, which is somewhat faster than **drop-on-demand printers**, and produce higher quality text and graphics.

Ink jet printers have many advantages over impact models, the most significant of which is noise. Ink jet printers are virtually silent. They also have low maintenance costs, with few moving parts. Typically, the life of an ink jet printhead is estimated at about 10 billion characters, compared to 200 million for many dot matrix printheads. Ink jet printers also have a 100% duty cycle, meaning that they can work through an entire day without problems. Generally, ink,jet printers range in price from $495 to $5,000. Hewlett-Packard's Thinkjet prints at a rate up to 150 cps and costs $495, while IBM's Color Jetprinter costs $745 and prints in seven colors.

With **thermal printers**, pins in a thermal printhead are heated, causing reactions on chemicall coated ribbons or paper. This is a quiet and inexpensive method of producing images. Thermal printers have the greatest influence in the home and low-end microcomputer markets. The major drawback is that these units offer poor print quality and require very smooth paper. Even typical copier paper may produce inferior results.

Electrosensitive printers use printhead needles that discharge an electrical current. This technology achieves extremely high print speeds, but the paper in unacceptable for business uses.

COMPUTER PLOTTERS

A plotter is an output device that uses pens to produce graphics (drawings, animation, charts, graphs, diagrams) by moving pens toward a specific X/Y coordinate along a horizontal carriage. There are three main plotter types: **flatbed, drum**, and **hybrid**.

Flatbed plotters can draw on a variety of materials, including single-sheet paper, transparencies, photosensitized plates, glass, and Mylar film.

Drum plotters can roll paper and produce much longer drawings, usually up to 240 feet.

Hybrid or "paper mover" plotters are a combination of the flatbed and drum plotter technologies. Like drum plotters, hybrids can produce continual output, yet they can be operated by a smaller, less expensive motor. Hybrids also take up less space than many flatbed plotters.

Many plotters, regardless of type, offer special features, such as automatic paper advance, self-diagnostics, digitizing, on and off-line operation, and special character sets.

Printer/plotters offer several advantages over plain plotters. They are more conducive to combining text and graphics than pen plotters. There are four basic types of printer/plotters available: dot matrix, ink-jet, electrostatic, and thermal.

Plotters and printer/plotters have many applications, ranging from graphic presentation of sales information to the creation of precise microelectronics schematics. For business uses, they can produce color pie charts and bar and line graphs for sales analysis, financial projections, and other statistics. Plotters also accept different pens (ballpoint and felt tip), providing the user with a variety of output qualities. Publishing applications typically demand high resolution and flexibility with text. HPGL and DM/PL are the most popular plotter languages used.

APPLICATION DEFINITION:

VOLUME. An estimate of the number of lines to be printed per month is needed. The easiest way to do this is to count or estimate the number of pages per month and then multiply that by the average page density or the average number of lines per page as a percent of the total possible lines per page. The average page density is 40% in business applications.

Obviously, if the quantity is in the hundreds of thousands, a high speed line printer would probably be the solution. If, on the other hand, the quantity is in the hundreds or low thousands, the needs may be met by a slower and less expensive serial printer. The ability of a printer to meet these needs is called throughput which is made up of a combination of factors including its rated speed in lines per minute or characters per second, its duty cycle, its special features that boost rated speed (bi-directional or logic seeking printing, for examples).

ENVIRONMENT: The application environment must be defined carefully. A printer that is to be used in an office environment for correspondence should produce better quality print than one used for draft work within an organization. In addition, it should be quiet enough so as not to disturb the office workers. The aesthetics of the system might also be important in the office, while not a consideration for printers in the "back room" environment producing in-house reports.

SPECIAL NEEDS: Each application needs to be studied for specialized needs in terms of fonts or paper handling characteristics. For example, graphics capabilities may be an important part of the printer's application, and the various units under consideration should support that capability. If multiple fonts are needed, the user should carefully evaluate the ease of changing from one to another. If specialized fonts are needed, the buyer must find out whether or not they are available. If specialized forms are used, that must also be considered.

These application needs should then be weighted, i.e., the most important should receive the greatest weight and the least desired features given the lowest weight.

PRODUCT SPECIFICATIONS

PRINT QUALITY: In general, solid font serial printers produce a more even and dense character than do dot matrix units, even though the matrix units are approaching letter quality printing.

Many of the dot matrix printers now have a dual mode option - the highest print speed is for draft work, while the system operates at a lower speed and placing more dots in each character for "letter quality" printing.

Line printers also come in solid font (band, belt, drum, chain and train printers) and in dot matrix versions. The solid font units generally produce a higher quality of print, even though, once again, the dot matrix units and dual mode dot matrix units are coming close to letter quality printing.

In evaluating dot matrix units, buyers should look at the resolution, which is generally expressed in two numbers (7x9, 9x9, etc.).

THROUGHPUT: The greatest gains in throughput over rated speeds, however, comes in the area of bi-directional or logic seeking printers. Bi-directional printers do not print each line from the left side of the paper. Instead, after printing one line from left to right, they print the next backwards from right to left.

Logic seeking printers take this one step further and calculate the shortest path to get to the next character to be printed. For example, if a line ends in the middle of the paper and the next character is to start with an indented paragraph, the print head will go directly to the amount of the indent from the end of the previous line.

If the unit has fast vertical tabbing capabilities, throughput may be improved in forms that have blank space between lines to be printed. Similarly, some units have a two speed operating capability where the higher speed can be used for horizontal tabbing to boost speed in producing such documents as spreadsheets. In some cases, this feature can more than double the throughput in those applications.

DUTY CYCLE: The duty cycle is the amount of time a printer will actually be printing during a typical day - not the amount of time the power is on. No printers are designed for a 100% duty cycle and most fall into the 25% - 40% duty cycle range, with some very heavy volume units reaching up to 60% - 70%. Most serial printers average a 25% duty cycle and line printers vary between 25% and 40%.

INTERFACE: Most printers come with a combination of interfaces such as RS-232, Centronics, parallel, etc.

INTELLIGENCE: Many printers come with a microprocessor and memory, which add to the functionality of the printer as well as to its cost. Memory buffers of 2K to 4K are common and allow users to print one page while working on another.

GRAPHICS: There is some graphics capability featured by most printers on the market today. The quality of the various types of systems depends on the application (bar charts, rough draft work, etc.).

FORMS HANDLING: Printers have many different ways of handling forms, including pin feed, friction feed, and various combinations of vertical, horizontal or bi-directional tractors. They may also have front inserters, cut sheet feeders or twin-sheet feeders. The forms and other paper to be handled by the printer have to be matched to the various types of forms handling equipment.

EASE OF USE: Today there are many ease of use features that are either included in the system or as options. These include indicators or alarms for such things as paper-out conditions and ribbon motion. In addition, many printers allow the buyer to easily set the forms thickness and lines per inch and come with self-diagnostic capabilities that can cut service time.

THE COMPUTER PRINTER MARKET

HISTORICAL SIZE & PERFORMANCE OF THE MARKET

DEFINITION OF THE MARKET

The estimated size of the market will differ substantially, depending on who one consults, and how printer sales are measured. Government figures represent **factory** sales of U.S. producers (including sales of foreign manufacturers operating in the U.S.)--but **not** including distributor and retail mark-ups. Sales figures do **not** include: service, supplies or spares. Products such as typewriters, teletypewriters, ticket printers, listers, P.O.S. printing mechanisms, calculator printers are **not** included.

GOVERNMENT/COMMERCE DEPARTMENT MARKET FIGURES

The U.S. Department of Commerce tracks sales of computer printers by **domestic** companies, and recently, in 1986, began tracking imports. **By 1986, U.S. manufacturers' sales reached $2.168 billion**, falling 5.6% from 1985 levels. In fact, this was the second consecutive decline, as shipments fell 2% in 1985 as well. The 1983-84 period was one of very strong growth, as the market expanded 46%. Over 878,000 units were reported shipped during 1986, up 8.7% from the 808,288 shipped in 1985.

Long-term growth in sales volume has advanced at an average annual rate of 30.6% from 1975-86, while **short-term growth** from 1980-86 has averaged only 3.9%. A significant contraction took place during 1982, when the value of computer printer sales plummeted 14.5%, and unit shipments fell 6.3%.

Since 1984, the Commerce Department began breaking out detailed types of computer printer sales, by **Serial** (impact & non-impact), **Line** (impact, non-impact), and **Page** types. As of 1986, serial type printers accounted for 68.4% of the total market, whereas line and page types (combined) accounted for 31.5%. The share for line and page types has risen from 28.8% only two years earlier.

In terms of units, the most commonly-sold printer is the **impact serial** type, 551,553 units in 1986. However, **non-impact serial** units have nearly quadrupled in volume sold between 1984 and 1986, from 56,000 to nearly 194,000. This type of printer is now second in unit volume. Over 120,000 impact line printers were shipped in 1986, and

8,615 non-impact line and page printers (combined) were sold in 1986.

WORLD TRADE: EXPORT MARKETS & IMPORT COMPETITION

Exports of printers were valued at $497 million during 1987, representing 20% of the total market value, and 337,000 units were shipped abroad, or 32% of the total. The value of printer exports reached a peak 24% of **domestic** sales in 1982, when U.S. sales volume dipped almost 15%. But, it stayed at this 18% level for three years, before inching up to 20% in 1987. In 1982, a peak 35% of total units shipped, were sent abroad.

Electronics, in its annual "Overseas Market Report", includes estimates for the size of various "data output peripherals" markets in Western European nations and Japan. **Japan is, by far, the largest market.** Its total computer peripherals market is estimated to be worth $6.6 billion in 1988, growing 27% per year from 1986-88. Computer printers constitute $4.48 billion of this total. The **impact** printer market is expected to grow 14% each year, but this is far outpaced by **non-impact** units--nearly 66% annual gains. For 1988, impact printers are estimated to be worth $2.58 billion in sales, versus $1.9 billion for non-impacts. Specific estimates for printers alone are not given for the West European nations, but the sizes of their overall data output peripherals markets in 1988 are estimated as follows........**West Germany**--$1.44 billion (8.3% yearly growth), The **United Kingdom**--$703 million (4.2% growth), **France**--$482 million (7.1% growth), and **Italy**--$379 million (13.2% growth).

Computer printer **imports** were not tracked by the Government until 1986, but in that year the staggering magnitude of import competition was fully illustrated. The Commerce Department reported that **4,689,000 units were imported (or 88% of the total market--U.S. apparent consumption), and these printers were worth $1.729 billion** (or 49% of U.S. apparent consumption-in value/dollars). (Apparent consumption = U.S. manufacturers' shipments, plus imports, minus exports). **Imports increased during 1987, to 5,556,000+ units, worth $1.988 billion. In 1987 then, imported printers represented an even higher 50% of the value of apparent consumption, and 89% of consumption in units.**

For the first time, in 1987, the Commerce department reported some detail regarding the **types** of printers being imported to the U.S. This data reveals that **Dot Matrix** printers accounted for nearly $965 million of the value of all printer imports, and 4,236,000 units. **Laser** printers accounted for the second-largest share, $667 million and 636,000 units. **Daisywheel** models contributed $61 million of the total, and 201,000 units, followed by **"other"** types at $295 million, and 482,900 units.

1987 & 1988 MARKET ESTIMATES

Marketdata estimates that U.S. producers' sales of computer printers (at the factory level) will reach $2.48 billion by 1987, a 14.6% gain. The strong growth in the personal computer market, spurred by Spring 1987 new product line introductions by Apple and IBM played a major role in this increase. **For this year, we expect growth to slow to a 9.8% increase, to $2.72 billion by year-end 1988.** In unit sales, we expect domestic manufacturers' shipments to be up 19% to 1,045,300 in 1987, and to increase another 13% to 1,181,200 in 1988.

1995 MARKET FORECASTS

For 1995, we expect 11.6 % average annual increases, to $4.78 billion in *U.S. producer sales*. To these figures one must add imports to arrive at the *true* value of the market. Assuming a steady 45 % share for imports, this would bring the value of the market to $8.90 billion by 1995.

Following are Marketdata's estimates for the market from 1986 to 1995:

	1986	1987	1988 E	1995 F
		($ Billions)		
U.S. Producer Sales	$2.17	$2.48	$2.72	$4.78
Imports (45% share)	1.73	2.01	2.19	4.12
Total Market:	3.90	4.49	4.91	8.90

TRUE MARKET POTENTIAL - INCLUDING RETAIL MARK-UP (Factory Sales plus Distributor Margins) - VALUE TO FINAL END-USER

Electronics, in its January 1987 "U.S. Market Report", estimated the 1985 market for printers to be worth $3.85 billion. **Comparing Electronics' estimate to Commerce Department figures, imports would then have amounted to $1.56 billion, or 40% of the total market.** This seems to make sense, considering the great number of active Japanese competitors. It is also corroborated by the 49% figure for 1986, derived from Commerce Department figures. If anything, the 40% level may be a little conservative.

Following later on in this section are Electronics' estimates of printer market size and segments from 1986-88. Basically, they expect total computer printer sales to grow 17.5% annually from 1986 to 1988, reaching $9.459 billion. The largest printer market segment is still impact types, but non-impact units are gaining fast. Impact printers' share of the total market is expected to fall from 65% in 1986 to about 54% by 1988, while non-impacts' share will rise from 34.7% to 46.5%. The fastest-growing sub-category is forecast to be "other" printers (thermal, electrostatic, other types)--82% yearly gains. Non-impact printers overall are expected to grow 40% per year.

Datek Information Services (a CAP International Co.) estimated the size of the market at $7.7 billion in 1986, compared to **Electronics'** $7 billion figure.

MARKET SEGMENTATION BY TECHNOLOGY AND COMPETITORS

Serial Dot Matrix Printers..........Sales were estimated by Datek Information Services at $3.64 billion in 1986 (and 4.4 million units sold). Japanese companies have continued their domination of this market, capturing almost 60% of all sales and 92% of shipments. Epson, Okidata and TEC/C.Itoh were said to control nearly 50% of the units sold. The U.S. suppliers to this market remains nearly the same as in 1985--mainly Genicom and Dataproducts. "Second-tier" suppliers include: Mannesmann Tally, Datasouth, MPI, and Facit. **Unit** growth in serial dot matrix printers is expected to average 8% yearly, while dollar **sales** growth will not fare as well, and may peak by 1990.

Serial Fully-Formed Character Printers.............Sales were estimated to fall substantially to $537 million in 1986 (and to 480,000 units). Little new funds, if any, are going into new product development, and the fact that "old habits die hard" may be the only reason that the daisywheel market will survive into the 1990s. Daisywheels have probably been impacted most by the page printer. Major suppliers to this segment include: Brother, NEC Information Systems, Ricoh and Qume. Several Japanese companies were forced to review their participation here (Silver Reed, Juki, Towa).

Serial Non-Impact Printers............Sales were estimated to rise slightly to $480 million in 1986 (677,000 units). Ink-jet printers now dominate this segment, accounting for 44% of 1986 shipments value. The major portion of new product activity took place in this segment. Major players here include: Diconix, Dataproducts, Howtek, Advanced Color Technology, Sharp, Exxon, Seiko Instruments, Mitsubishi, CalComp, Versatec, and Hewlett-Packard. Apple and GE got out of the low-end business of this segment in 1986. Most activity within this market segment was concentrated in specialized areas, such as thermal teleprinters (Panasonic at the low-end). Also, the growing laptop computer segment is attracting portable thermal, thermal transfer, and ink-jet printers with relatively low prices and power demands.

Non-Impact Page Printers............Sales were estimated to increase 66% to $1.93 billion during 1986 (with 292,000 units sold). This market segment is expanding rapidly. Canon engine units, in their varied configurations, accounted for over 75% of the $1 billion low-end market. Ricoh's 4080 and the Xerox 4045 are also successful engines. Page Description Languages (PDLs) have been touted as the key to advanced page layout functions and device independence. They have expanded beyond the Apple Macintosh environment, creeping into the network, mainframe, and on-demand publishing environments. Systems are available from HP, Okidata, Epson and Citizen. There is a trend in the configuration of page printers to offer an "upgrade path" as users demand more output sophistication.

Dot Matrix Line Printers...........Sales were estimated to rise to $377 million during 1986 (and 49,000 units). This market segment rebounded in 1986, with an increased number of new models and the revamping of existing ones, as well as the elimination of earlier technical problems. Mannesmann Tally and Genicom have been very successful in the OEM business, with Hewlett-Packard doing well at the high end. Decision Data, Genicom, and CIE Terminals ate away at Printronix' share of market. Overall, this segment looks promising. Price/performance and increased graphics capabilities were the focus of competitors here during 1987. Producers are concerned with staying ahead of non-impact technologies, by introducing product improvements that will increase dependability and graphics flexibility, while reducing cost-per-page.

Fully Formed Line Printers..........Sales slid about 8%, to $763 million during 1986 (and to 50,000 units). The line printer market (band, chain, belt printers, etc.) is characterized by a lack of flexibility, increased pressure from line and serial matrix printers, and a change in printing requirements. 1986 was the fourth consecutive year of decline in sales of these printers. Established competitors discontinued many of their models in 1986-87, the most notable being AT & T. Genicom, Centronics and Fujitsu also eliminated products. Dataproducts, Centronics and Printronix have all experienced tough times in the high-speed sector, as OEM business was sluggish due to weak mainframe markets. One of the strong players, however, is Storage Tek, strong in the IBM replacement market.

During the next few years, the key issue in this market will be the concentration on dealer/distributor replacement business and niche market applications. The fact that this is a mature segment doesn't mean that there are no growth opportunities, only that they exist in more specialized areas. Low costs and high reliability still make full character line printers very competitive in high-volume, low cost-per-page environments.

NATURE/STRUCTURE OF THE MARKET

In an October 1984 report of the computer printer market Marketdata estimated that over **230** companies were active competitors. Many of these are foreign. In April of 1986, Dataproducts marketing personnel estimated that there were **192** computer printer manufacturers worldwide. Whatever the number, it is too many for the market. Looking at the supplier list in many computer/printer directories, the roster reads like a "who's who" of Japanese firms, including: Canon, C.Itoh, Citizen America, Epson, Fujitsu, Juki, Okidata, NEC, Panasonic, Ricoh, Sanyo, Sony, Toshiba and more.

Many U.S. companies operate manufacturing plants overseas, and a great deal of joint ventures, acquisitions, and technology sharing has taken place and will continue as firms seek to maximize efficiency and derive the lowest possible costs to survive in this intensely competitive marketplace.

Many Japanese companies are considering manufacturing sites in the U.S. and Europe to ease trade tensions. Epson set up a printer facility in July 1986 near Portland, OR, which currently makes 20,000 dot matrix printers monthly. Epson plans to locate manufacturing plants in other nations as well. This is in addition to its French plant that turns out thermal printers at the pace of 5,000-6,000 units monthly. Epson's future development will include laser printers and color video printers.

Alps Electric began operating a new printer/office equipment plant in

Korea in September 1984, and has allocated $85 million for Korean investments. Korea now accounts for 95% of Citizen's mini-printer production.

LATE-BREAKING MARKET DEVELOPMENTS

* Quality Micro Systems Inc. (Mobile, Ala.) has agreed to purchase Imagen Corp. in a stock deal valued at approximately $17 million (2/29/88). Under terms of the deal, QMS would acquire the privately-held Santa Clara, CA-based image processing firm for 1,850,000 shares of common stock. The transaction, upon approval of shareholders and the SEC, is expected to be completed in early May, when Imagen would operate as a wholly-owned subsidiary. Although no sales figures are available for privately-held Imagen, sources indicated the firm had more than $24 million in 1987 sales. QMS had sales of about $120 million in fiscal 1987 and projects revenues of $180 million in the current year. Imagen employs 150 and QMS employs 900 people. QMS stated that the acquisition would give the firm access to the West Coast market, with better access to Silicon Valley vendors.

* 3M buys stake in printer spinout.........(2/29/88)......3M (St. Paul, MN) has purchased a 6% stake in Printware, Inc., a Mendota Heights, MN laser printer vendor. Neither firm would disclose the value of the deal, but sources said 3M paid about $1 million. 3M holds warrants to purchase nearly 20% of Printware. Printware, which was spun out by 3M in 1985, markets its laser printers under a joint agreement which allows it to use 3M technology in exchange for a royalty payment (reportedly 4% of laser printer revenues). 3M said the investment would not alter the marketing relationship between the firms.

* Hewlett-Packard's Vancouver, WA division has developed a thermal ink-jet printer that provides 300 dpi print quality--comparable to that of a laser printer. HP's Deskjet sells for $1,000, about the price of a 24-pin dot matrix unit. The U.S.-made printer uses a patented disposable thermal ink-jet print head to print at twice the speed of a dot matrix model--240 cps in draft mode and 120 in letter quality. The printer contains a Z80 microprocessor and custom gate array, with a dc motor running the print head. Shipment of the Deskjet was slated for February, and it is said to represent the first major technology advance in printers to come out of the U.S. in years.

* NEC's visible-light laser diode promises faster laser printers........NEC claims this diode can outperform those now used in laser printers, bar

code readers, and optical disks. Samples will be offered in March for about $320 each. The amorphous silicon used in the drums of many laser printers is four times more sensitive to the NDL3200 laser's 680-nm wavelength than present technologies, allowing faster printing. It reads any color bar code, whereas the contrast afforded by present lasers is often too low for many colors to be recognized. The NDL3200 delivers 1.5 times more recording density than the 830-nm wavelength now used for optical-disk writing, says NEC.

THE COMPUTER PRINTER & PLOTTER MARKET

U.S. MANUFACTURER SALES OF COMPUTER PRINTERS

	VALUE OF SHIPMENTS ($ Thous.)	ANNUAL % CHANGE	UNIT SHIPMENTS	ANNUAL % CHANGE
1975	$ 497, 048			
1976	599, 766	20.7	170, 941	
1977	826, 096	37.7	230, 960	35.1
1978	748, 337	-9.4	231, 505	0.2
1979	1, 005,698	34.4	318, 188	37.4
1980	1, 258,840	25.2	341, 745	7.4
1981	1, 813,387	44.1	529, 146	54.8
1982	1, 550,582	-14.5	495, 824	-6.3
1983	1, 921,602	23.9	888, 176	79.1
1984	2, 344,487	22.0	1, 100,128	23.9
1985	2, 297,228	-2.0	808, 288	-26.5
1986	2, 168,161	-5.6	878, 434	8.7
ESTIMATE				
1987	2, 484, 700	14.6	1, 045, 300	19.0
1988	2, 728, 000	9.8	1, 181, 200	13.0
FORECAST				
1995	4, 780, 000	11.6 *	1, 270, 800	1.1 *

* Average annual rate

SOURCE: U.S. DEPT. OF COMMERCE, CURRENT INDUSTRIAL REPORTS–
COMPUTERS, OFFICE & ACCOUNTING MACHINES,
MARKETDATA ESTIMATES & FORECASTS

THE COMPUTER PRINTER & PLOTTER MARKET

MARKET PROJECTIONS BY OTHER MARKET RESEARCH FIRMS
TOTAL PRINTER SHIPMENTS - BY TYPE

IN UNITS SHIPPED	1985	1986	1987	1988*	1989*
Dot Matrix	3, 641	3, 497	3, 605	3, 730	4, 088
Daisywheel	548	288	248	213	192
Laser (0-10 PPM)	103	268	491	693	866
TOTAL:	**4, 292**	**4, 053**	**4, 344**	**4, 636**	**5, 146**
% OF TOTAL					
Dot Matrix	84.8	86.3	83.0	80.5	79.4
Daisywheel	12.8	7.1	5.7	4.6	3.7
Laser	2.4	6.6	11.3	14.9	16.8
IN MILLION $					
Dot Matrix	$ 2, 312	$ 2, 102	$ 2, 092	$ 2, 152	$ 2, 264
Daisywheel	406	230	174	134	112
Laser	390	851	1, 331	1, 503	1, 595
TOTAL:	**3, 108**	**3, 183**	**3, 597**	**3, 789**	**3, 971**
% OF TOTAL					
Dot Matrix	74.4	66.0	58.2	56.8	57.0
Daisywheel	13.1	7.2	4.8	3.5	2.8
Laser	12.5	26.7	37.0	39.7	40.2

DOT MATRIX-BY TYPE

IN UNITS					
8-PIN	3, 447	3, 456	2, 978	2, 889	2, 693
18-PIN	40	100	140	166	181
24-PIN	158	326	498	693	958
% OF TOTAL					
8-PIN	94.6	89.0	82.4	77.1	70.3
18-PIN	1.1	2.6	3.9	4.4	4.7
24-PIN	4.3	8.4	13.8	18.5	25.0
IN MILLION $					
8-PIN	$ 2, 109	$ 1, 822	$ 1, 588	$ 1, 538	$ 1, 547
18-PIN	56	117	145	153	149
24-PIN	147	257	359	461	568
% OF TOTAL					
8-PIN	91.2	83.0	75.9	71.5	68.3
18-PIN	2.4	5.3	6.9	7.1	6.6
24-PIN	6.4	11.7	17.2	21.4	25.1

*** Projected SOURCE: Dataquest, Marketdata % of totals calcul.**

THE COMPUTER PRINTER & PLOTTER MARKET

COMPUTER PRINTER & PLOTTER SALES, BY TYPE
(1986-1988 Forecasts)

TYPE PRINTER	1986	1987	1988 F	AVERAGE ANNUAL GROWTH
	---------($ Millions)----------			
Printers, Total:	$ 7,009	$ 8,588	$ 9,459	17.5
Impact Printers	4,580	5,130	5,060	5.2
Non-impact Printers	2,429	3,458	4,399	40.6
Laser Printers	1,589	1,923	2,175	18.4
Other (thermal, electrostatic, other)	840	1,535	2,224	82.4
Plotters	897	1,076	1,237	18.9

---------Percent of Total, By Type Printer ------------

	1986	1987	1988 F
Impact	65.3	59.7	53.5
Non-impact	34.7	40.3	46.5
Laser	22.7	22.4	23.0
Other	12.0	17.9	23.5

**SOURCE: ELECTRONICS MAGAZINE, 1988 U.S. MARKET REPORT,
MARKETDATA CALCULATIONS**

THE COMPUTER PRINTER & PLOTTER MARKET

COMPUTER PRINTER SALES, BY DETAILED TYPE

VALUE OF SHIPMENTS & UNIT SHIPMENTS BY U.S. MANUFACTURERS

---------- VALUE OF SALES ----------
---------($ Thousands)----------

	--- SERIAL ---		--- LINE---		PAGE
	Impact	Non-Impact	Impact	Non-Impact	
1983	------------------- $ 1,921,602-------------------				
1984	616,205	1,052,715	558,157	----117,410----	
1985	729,106	1,061,769	564,295	----86,560----	
1986	747,936	735,933	588,011	----96,281----	

--------- UNIT SALES ----------

1983	--------------- 888,176 -----------------				
1984	943,397	56,136	93,970	---- 6,625 ----	
1985	611,296	180,030	87,230	---- 6,041 ----	
1986	551,553	193,990	120,276	---- 8,615 ----	

SOURCE: U.S. DEPT. OF COMMERCE, CIR MA 35R

THE COMPUTER PRINTER & PLOTTER MARKET

COMPUTER PRINTER EXPORTS & IMPORTS TRENDS

	EXPORTS		EXPORTS RELATIVE TO U.S. MANUFACTURERS' SALES	
	VALUE AT PORT	UNITS	VALUE	UNITS
	($ Thous.)		(PERCENT)	
1978	$ 137, 564	46, 692	17	20
1979	188, 546	71, 701	17	23
1980	296, 860	107, 011	21	31
1981	334, 447	146, 733	17	28
1982	418, 783	172, 700	24	35
1983	468, 333	243, 550	22	29
1984	466, 999	268, 514	18	24
1985	460, 875	245, 728	18	30
1986	427, 439	265, 015	18	30
1987	497, 065	337, 052	20	32

	IMPORTS FOR CONSUMPTION		IMPORTS AS % APPARENT CONSUMPTION *	
	VALUE ($000)	UNITS	VALUE	UNITS
1986	$ 1, 729,439	4, 689,260	49	88
1987	1, 988, 369	5, 556, 898	50	89

* Derived by adding imports and mfrs. shipments, minus exports.

SOURCE: U.S. DEPT. OF COMMERCE, CIR MA 35R

THE COMPUTER PRINTER & PLOTTER MARKET

1987 IMPORTS OF COMPUTER PRINTERS, BY TYPE
(Imports For Consumption)

	DAISYWHEEL	DOT MATRIX
VALUE (at port)-$ Millions	$61.2	$964.6
QUANTITY (# of units)	201, 139	4, 236, 104

	LASER PRINTERS	OTHER TYPE PRINTERS
VALUE	$667.5	$ 295. 0
QUANTITY	636, 712	482, 943

SOURCE: U.S. Dept. of Commerce, FT 135, Imports For Consumption

THE COMPUTER PRINTER & PLOTTER MARKET

MAJOR OVERSEAS MARKETS FOR COMPUTER PERIPHERAL EQUIPMENT
(1986 - 1988 Forecasts)

	1986	1987	1988	Avg. Annual % Change
	--------($ Millions)---------			
JAPAN				
Total Data Output Peripherals	$4,284	$5,5854	$6,613	27.2
Plotters	152	212	242	29.6
Printers, impact type	2,017	2,449	2,583	14.0
Printers, nonimpact	823	1,500	1,906	65.8
WEST GERMANY				
Total Data Output Peripherals	1,238	1,338	1,444	8.3
UNITED KINGDOM				
Total Data Output Peripherals	648	666	703	4.2
FRANCE				
Total Data Output Peripherals	422	450	482	7.1
ITALY				
Total Data Output Peripherals	300	336	379	13.2

NOTE: All figures in current U.S. dollars. Figures based on survey made by Electronics magazine in October/November 1987, estimated noncaptive consumption of equipment, valued at factory prices for domestic products and landed cost for imported products.

EXCHANGE RATES USED: Japan-125 yen to $1, W. Germany-1.60 marks to $1, United Kingdom-$1.85 to 1 pound, France-5.55 francs to $1, Italy-1,200 lire to $1.

SOURCE: Electronics Magazine, Jan.1988 Overseas Market Report

THE TELEPRINTER MARKET

Teleprinters are grouped, by the Commerce Department, under "general purpose" computer terminals. They are defined as: "interactive terminals with a hard-copy printer, which may also include a paper tape punch or other add-on device". They are not independent, stand-alone devices such as dot matrix, laser, or other printers. Rather, they are a "hybrid" of a CRT terminal and a printer.

HISTORICAL SIZE AND GROWTH OF THE MARKET

The **value** of shipments of these devices by U.S. manufacturers reached a peak $481.7 million during 1986, up 9.2% over the prior year. In units, over 376,000 teleprinters were shipped from U.S. factories, inching up 2.9% over 1985 levels. Over the long term (1978-86), the **value** of teleprinter sales grew at a strong 17.8% average annual pace, but growth from 1981-86 has been a much slower 2.2% annual increase. In **units**, average annual growth from 1977 to 1986 was 10.5%, and 1.3% from 1981 to 1986. The bulk of the growth in the teleprinter market took place during the early 1980s.

The Commerce Department classifies teleprinters by speed (in characters per second-CPS). Based on incomplete data available, over 54% of the value of teleprinter sales in 1986 was of units in the **100-200 CPS** category ($65 million), followed by "**100 CPS** and under" (27.5% and $33.1 million), and the "**over 200 CPS**" speed units (18.5% and $22.2 million).

1987 & 1988 ESTIMATES, 1995 FORECAST

Marketdata estimates that teleprinter sales increased by 6.3%, to $512 million in 1987. Unit shipments are expected to have risen 6.3% as well, to 400,000. For 1988, we expect teleprinter sales to increase by a stronger 12.5%, to $576 million, with a 12.5% gain in unit sales, to 450,000.

Appliance magazine reports that the average "multi-station CRT/teleprinter" has a useful life before replacement of 5 years. They expected that 400,000 teleprinter units "for replacement" were consumed during 1987, growing 15% to 460,000 in 1988.

Through 1995, Marketdata forecasts annual growth a little under 4% yearly, to $732 million, taking into account recent sales and unit growth patterns of the past seven years, and the expectation of a recession by 1989-1990.

THE COMPUTER PRINTER & PLOTTER MARKET

TELEPRINTER SALES, BY TYPE, BY U.S. MANUFACTURERS

VALUE OF SHIPMENTS ($ THOUSANDS)

	TOTAL	UP TO 20 CPS	21-100 CPS	101-200 CPS	OVER 200 CPS
1978	$ 198,493	$ 130,718		$ 67,775	
1979	253,534	127,175		126,359	
1980	353,432	197,175		156,257	
1981	433,448	224,752		208,696	
1982	460,167	243,626		216,541	
1983	449,647	172,220		200,964	76,463
1984	369,281	106,303		185,177	77,801
1985	441,231	60,843+		88,459+	21,110+
1986	481,744	33,105+		65,150+	22,245+
ESTIMATE					
1987	512,000				
1988	576,000				
FORECAST					
1995	732,000				

Note: Detailed shipments data, by CPS speed, not available for 1985 & 1986, for shipments classified under CIR MA36P (Commun. Equip.). Actual shipments will be higher, signified by a + .

*** Interactive terminals with a hard-copy printer, may also include a paper tape punch or other add-on device.**

SOURCE: U.S. DEPT. OF COMMERCE, CIR MA 35R, MA 36P

THE COMPUTER PRINTER & PLOTTER MARKET

TELEPRINTER SALES, BY TYPE, BY U.S. MANUFACTURERS

------ UNIT SHIPMENTS -------

	TOTAL	UP TO 20 CPS	21-100 CPS	100-200 CPS	OVER 200 CPS
1977	193,610	NA	NA	NA	NA
1978	125,839	---- 97,199 ----		---- 28,640 ----	
1979	161,713	---- 95,121 ----		---- 66,592 ----	
1980	308,652	---- 189,402 ----		---- 119,250 ----	
1981	353,816	---- 186,674 ----		---- 167,142 ----	
1982	420,381	---- 218,615 ----		---- 201,766 ----	
1983	305,440	---- 149,433 ----		57,121	98,886
1984	300,924	---- 110,781 ----		64,517	125,626
1985	365,664	---- 85,030 + ----		59,025+ *	19,509+ *
1986	376,227	---- 46,176 + ----		56,797+	20,254+
ESTIMATE					
1987	400,000				
1988	450,000				

Note: Detailed shipments data, by CPS speed, not available for 1985 & 1986, for shipments classified under CIR MA36P (Commun. Equip.). Actual shipments will be higher, signified by a +.

*** 10-25% of this figure is estimated.**
NA - Data not available

SOURCE: U.S. DEPT. OF COMMERCE, CIR MA 35R

THE COMPUTER PLOTTER MARKET

HISTORICAL SIZE & PERFORMANCE OF THE MARKET

The Department of Commerce reported that U.S. computer plotter producers shipped $477.8 million worth of products during 1986, a 2.5% gain over the prior year. Over 137,500 units were shipped, 90,000 of which had price tags of $500-2,500 (at the factory level). Over 78% of the value of 1986 shipments were of plotters costing $2,500-15,000 or more.

It should be noted that plotter shipments reported by the Dept. of Commerce jumped sharply in 1985, due to the inclusion for the first time of several large manufacturers' sales, that were not included in prior surveys. Therefore, comparison of 1985 and 1986 data cannot be made to pre-1985 activity. A total of 12-15 firms are now included in the survey.

Electronics, in its January 1988 "U.S. MARKET REPORT", estimates the plotter market to be sustantially larger than the official Government figures, **$897** million in 1986. They forecast a 20% gain to **$1.076** billion in 1987 and a 15% increase to **$1.237** billion by 1988. Like computer printers, a closely related machine in terms of end-users and applications, heavy imports are probably involved, accounting for the major difference between Electronics' estimates and the Commerce Department survey. The ***exact*** amount of these imports is not known.

However, plotters tend to carry higher price tags than printers, and the market is not quite as heavily affected by low-end imports from Japan. Such U.S. companies as Versatec (Xerox co.), Hewlett-Packard, Houston Instruments, Gerber Scientific, and Tektronix are major players.

1987 & 1988 MARKET ESTIMATES

International Data Corp. placed plotter sales at $300.9 million in 1985 and at $350.8 million in 1986. They predicted a gradual rise in the market, to $409 million in 1987 and $576 million by 1991. (This implies 12.8% average yearly growth from 1986-1991.) **Datapro Research Corp**. corroborates this trend, with estimated sales of $311 million in 1986, and a predicted rise to $407 million by 1987 and $813 million by 1991 (much higher, 32% annual rate of growth, though).

Consequently, Marketdata estimates that ***U.S. producers'*** sales of plotters will grow 19% to **$569.5 million in 1987 (and 158,200**

units), and increase 14.6% to $652.7 million by 1988 (and 176,400 units). Growth should be strong, but perhaps not as strong as forecasted by Electronics magazine.

1995 MARKET FORECASTS

We feel that **growth through 1995 will average 8.1% per year.** After all, sales grew by only 2.6% per year (average annual rate) from 1981-85. In addition, competitive pressures from the large number of producers in the market should hold down prices--so market expansion (in sales dollars) will have to come from "real" or unit increases. **Consequently, Marketdata forecasts plotter sales by U.S. manufacturers to reach $1.022 billion by 1995, and 218,500 units (3.4% annual increases in unit sales).**

NATURE/STRUCTURE OF THE MARKET

The plotter market continues to grow, and they remain the choice output device for applications requiring clean lines, multiple colors, and the ability to print on special materials. However, printer/plotter combination devices are gaining on the turf of traditional pen plotters. More so than printers, plotters are utilized by the scientific community for more graphics, tables, charts, etc., rather than heavy word processing/text applications.

Both plotters and printer/plotters face increasing competition from general printers, especially high-resolution color dot matrix and monochrome laser printers. Because of this competition, some vendors have discontinued plotters.

Even though pen plotters cost as little as $995, users may find the same 18 or 24-pin dot matrix printer they bought for text adequate for business graphics such as charts. Plotters at best occupy a small market. Datapro Research estimates plotter sales at less than 5% of the printer market. An indication of the rising popularity of printers over plotters is the lack of growth in the plotter vendor list. Indeed, Epson and Facit recently withdrew their plotters from the market, as well as Apple Computer.

Printer/plotters as a group, are said to suffer from an identity problem. Datapro defines them as printers that are designed as plotters and marketed as such. However, indicators still point to healthy growth for printer/plotters. There are basically four types of printer/plotters.....dot matrix, ink-jet, electrostatic, and thermal. Thermal transfer types are the most prevalent kind on the market. Printer/plotters offer several advantages over plotters. For one, they are more conducive to combining text and graphics than pen plotters. Some rival typewriters in text quality.

Some of the major competitors in the plotter market include the following companies.........

Astro-Med Inc.
BBC-Metrawatt/Goerz
Benson-Schlumberger
Bruning Computer Graphics
CalComp (Lockheed)
Computer Talk Inc.
Datametrics Corp.
Enter Computer Inc.
Gerber Scientific
Hewlett-Packard
Houston Instruments
IBM
Ioline Corp.
Mannesmann Tally
Numonics Corp.
Printronix
Roland DG
Seiko Instruments USA
Taxan USA Corp.
Tektronix Inc.
United Innovations
Versatec (Xerox Co.)
Western Graphtec Inc.

(See complete address listing of manufacturers at back of report.)

The most significant players in the market are probably Hewlett-Packard and Gerber Scientific--both of which are heavily invested in serving the needs of the scientific community, not only in plotters but calculators and other products.

Gould (Rolling Meadows, IL) used to be in the field but put its graphics plotter business up for sale in January of 1986. This operation was located in Mitcham, England, employed 90 workers, and was engaged in the manufacture of X-Y plotters. The operation was part of Gould's Recording Systems Division located in Cleveland.

Some plotters' price tags are quite high. Versatec, in September of 1985, introduced two electrostatic models capable of plotting on paper 24 inches and 36 inches wide. The former was priced at $49,800 and the latter at $72,200. Many models are not that expensive, though. Axion was marketing a 3-pen $399 plotter for use with personal computers a few years ago. The most expensive plotters are those with multiple-pen, wide printing ranges, geared toward scientific/engineering users in universities, research laboratories, and large corporations.

LATE-BREAKING MARKET DEVELOPMENTS

* Under an agreement signed in January, 1988, CalComp Inc. (an Anaheim, CA supplier of computer graphics products) will resell a line of desk-top color plotters for computer-aided design applications from Minolta Camera Co. of Osaka, Japan.

THE COMPUTER PRINTER & PLOTTER MARKET

COMPUTER PLOTTER SALES BY U.S. MANUFACTURERS

	VALUE OF SHIPMENTS ($ Thous.)	ANNUAL % CHANGE	UNIT SALES	ANNUAL % CHANGE
1979	$ 43, 570		7, 808	
1980	81, 977	88.2	10, 066	28.9
1981	223, 166	172.2	19, 084	89.6
1982	246, 124	10.3	15, 520	-18.7
1983	232, 210	-5.6	25, 526	64.5
1984	240, 755	3.7	27, 675	8.4
1985 *	466, 112	*	134, 571	*
1986 *	477, 846	2.5	137, 551	2.2
ESTIMATE				
1987	569, 500	19.2	158, 200	15. 0
1988	652, 700	14.6	176, 400	11.5
FORECAST				
1995	1, 022, 800	8.1 **	218, 500	3.4 **

*NOTE: Several large firms incl. in survey for first time in 1985. Comparisons to earlier years not valid. Total no. of firms in survey is 12-15.

**** Average annual rate**

DETAILED BREAKDOWN OF PLOTTER SALES, BY COST OF PLOTTER

	--- 1986 ---		--- 1985 ---	
	VALUE	UNITS	VALUE	UNITS
	---------($ Thous.)---------			
Less Than $500-2500	$104, 317	90, 101	$104, 020	88, 915
$2500-15,000 or more	373, 529	47, 450	362, 092	45, 656

SOURCE: U.S. DEPT. OF COMMERCE, CIR MA 35R, MARKETDATA ESTIMATES & FORECASTS

THE COMPUTER PRINTER & PLOTTER MARKET

COMPUTER PRINTER & PLOTTER SALES AS A PERCENT OF TOTAL COMPUTER PERIPHERAL EQUIPMENT SALES

	VALUE OF TOTAL COMPUTER PERIPHERAL EQUIP. SALES * ($ Thous.)	ANNUAL PERCENT CHANGE	COMPUTER PRINTER & PLOTTER SALES AS % PERIPHERAL EQUIP.
1977	$ 6, 268,492		---
1978	7, 110,704	13.4	---
1979	8, 975,707	26.2	11.7
1980	11, 048,298	23.1	12.1
1981	14, 014,802	26.9	14.5
1982	14, 659,342	4.6	12.3
1983	16, 748,884	14.3	12.9
1984	19, 298,861	15.2	13.4
1985	18, 252,509	-5.4	15.1
1986	16, 888,371	-7.5	15.7
Avg. Yrly. Increase: 1977-86		18.8	---
ESTIMATE			
1987	19, 759, 400	17. 0	16.2
1988	22, 130, 500	12. 0	16.8
FORECAST			
1995	25, 568, 000	8. 0 **	17.4

*Includes disk drives, storage equipment, communication interface equip. (carriers, modems), terminals, printers, plotters, input/output devices, media-to-media data conversion equip., magnetic disks, tapes, cassettes, cartridges, etc.

** **Average annual rate**

MARKET SHARE ESTIMATES - PERSONAL COMPUTER PRINTERS

A February 1987 usage survey by the Datapro Research Corp. of New Jersey reported that **Epson** "...has been the leader in printers for personal computers for many years." Their usage survey shows that the company received virtually double the percentage of response, or 30.8%, of its closest competitor--**Okidata** (15.8%). One of the edges Epson has had is its OEM arrangements with major vendors such as IBM and other PC producers.

Frequently, Epson printers have been purchased with another vendor's name attached. No other mass producer of small, inexpensive, and quality printers has penetrated the market so well. Whenever a customer walks into a computer store and can immediately choose a printer with a desired system, this is an advantage.

The Datapro survey reveals an interesting response to **Apple** printers. These printers, although high-quality and versatile, apparently were bypassed by a significant number of Apple purchasers, perhaps in favor of Epson or Okidata. Price was probably a big factor.

Following are the results of Datapro's 1987 usage response survey, for PC printers bought...........

COMPANY	% OF TOTAL UNITS USED
1. Epson	30.8
2. Okidata	15.8
3. IBM	7.3
4. Apple	6.5
5. NEC	5.5
6. Hewlett-Packard	4.4
7. Texas Instruments	3.4
8. Diablo	3.0
9. C. Itoh	2.0
10. Toshiba	1.9
11. Qume	1.1
12. Datasouth	0.9
13. Brother	0.7
14. Mannesmann Tally	0.6
15. Star Micronics	0.6
16. Anadex	0.6

Table continued...........

17. Centronics	0.5
18. Dataproducts	0.4
19. Silver Reed	0.2
20. Juki	0.1
21. All others	13.7

Another portion of the survey measured customer satisfaction with PC printers. Eight categories were measured: ease of use, ease of installation, documentation, print quality, quietness, value, service/support, and overall satisfaction.

The top six manufacturers in terms of "overall satisfaction" were, in this order...........1) Hewlett-Packard, 2) Toshiba, 3) Apple, 4) Texas Instruments, 5) Brother, and 6) Juki. The top companies in each of the respective categories or aspects were as follows............

Ease of use	Hewlett-Packard
Ease of installation	Brother
Documentation	Brother
Print quality	Centronics
Quietness	Hewlett-Packard
Value	Hewlett-Packard
Service/Support	Apple

There are at least 44 companies making laser printers today (according to a Fall 1987 issue of Personal Computing magazine). These companies bring to market no less than 84 different laser printer models. Supporting this equipment are at least 44 companies that produce desktop publishing software--11 specific prgrams geared for Apple Macintosh computers and another 37 different programs designed for the IBM and IBM-compatible computers' MS-DOS operating system. (A complete list of these hardware and software companies is included at the end of this section.)

The price of laser printers has declined steadily, and so prospective buyers of high-resolution dot matrix printers or top-speed daisywheels are now considering the laser printer as a real alternative. Lower-priced laser printers are usually slower than their higher-priced relatives, but they can still print six or eight pages per minute (ppm) of letter-quality output. As print speed rises so does the price.

Prices are falling because of several reasons. First, there are more companies making laser printers every day, many of which previously only made impact printers. Secondly, many firms are now manufacturing their own **engines.** A few years ago, most engines used in laser printers were made by Canon or Rich, but now companies such as Toshiba, Kyocera, Kentech, Dataproducts, Xerox, Fujitsu, and Panasonic are using their own engines.

Laser printers will not take over the entire market becasue good dot matrix units can do things lasers cannot, such as handle multiple-part forms and wide-carriage paper, as well as print in color (however this is changing now as the first color laser printers have appeared). But, the laser printer does have many features the dot matrix does not. They produce letter-quality type nearly identical to daisy wheel units and graphics at a fraction of the noise level. And, they are faster.

The **Datapro Research Corporation** estimated that laser printers will account for 4.8% of the total number of printers sold in 1986, up from 1.5% in 1985. Their survey confirms that at least 18 new laser printers were introduced in the first three quarters of 1986 alone.

In the $5000-6000 price range, the Apple LaserWriter was both the first, and for a long time, the only game in town. But this is changing quickly. There are now over six 300-dots per inch (dpi) PostScript printers, all roughly the same price, and more coming to market all the time. Some of the more well-known laser printers are the following........ Apple's

LaserWriter Plus, the Laser Connection's PS Jet+, Texas Instruments" OmniLaser 2108, and Qume's Laser ScripTEN.

DESKTOP PUBLISHING

The big issue regarding printers today is, of course, desktop publishing. Price tags of **laser printers** have come down (to the $1500-2000 range) as power and capabilities of personal and microcomputers have increased. This has made it economically feasible for many small businesses, large corporations, government agencies, educational institutions, as well as personal computer users at home, to produce "letter quality" flyers, repots to shareholders, in-house magazines, ads, sales/marketing materials, catlogs, price lists, manuals, directories, brochures, newsletters, and camera-ready artwork.

The latest development is **color** capability. Although color dot matrix and ink jet printers are now available at reasonable prices, the quality is not quite what desktop publishers demand. Laser printer makers see color as an area with large potential and are investing big R & D dollars in it. Users, though, are questioning whether they really ***need*** color and are not willing to spend more than 20% more than black & white for it. **International Resource Development**, a Connecticut consulting firm, estimates that color printers currently account for 8% of total printer unit sales and 5% of revenues. Unit sales are expected to rise five-fold by 1991.

Desktop publishing software is used to designate typographic styles and sizes; lay out text in columns; combine line art, scanned photos, and graphs; and flow text from one page to another. How well the prgrams accomplish these tasks and the kind of printers they support usually determines the price tag on the software.

Business professionals probably won't be satisfied with anything less than laser printer output. A page printed at 300 dpi on plain paper could be photocopies or turned into a mechanical for offset printing. People who are used to traditional typeset quality (1,000-2,000 dpi) may even view desktop laser printer output as "draft quality" and use it as an intermediate step before sending pages to high-resolution typesetting equipment.

Before desktop publishing programs received their name, they were called typesetting programs. The new wave of desktop publishing software attempts to match the printed output by putting real headlines, italics, and proportional fonts on the screen. Programs now are also more likely to contain syle sheets to take the work out of designing a document.

With the advent of desktop publishing, page description language (PDL) is gaining importance as a printer feature. Postscript, Adobe System, Inc.'s PDL, is currently the most widely used PDL on the market and, now that it has acquired both Apple's and IBM's support, it is well on its way to becoming the industry standard. Postscript software actually resides in the printer. Xerox also has its own PDL, Interpress, while Imagen has DDL, its document description language.

Becasue Postscript is such a complex language, many software packages that support Postscript do so only in part. Popular packages that support the program are.........Ventura Publisher, PageMaker, Harvard Professional Publisher, Click-Art, PC Paintbrush 3.5, ChartMaster, Microsoft Word, WordPerfect 4.2, Lotus Manuscript, and Words and Figures.

Despite its advantages, Postscript can increase the cost of a lser printer by $2,000. That may put such units over the edge of what a small business can afford. One should also be wary of advertised print speed claims. Hewlett-Packard's LaserJet family, billed as printing 8 pages per minute, will print 8 ppm of ***text*** Printing graphics or a combination of text and graphics slows down print speeds.

An often heard complaint about PostScript printers is that they are slow-rarely achieving their rated "throughput". "Duty cycles", calculated in pages per month, can range from 3,000 to 25,000 depending on the laser printer. The more memory a printer has, the larger an area it can print or image. The LaserWriter Plus, for example, can not image a full legal-size page-not because the printing engine is incapable of it, but because there's not enough memory.

THE COMPUTER PRINTER & PLOTTER MARKET

LIST OF MAJOR DESKTOP PUBLISHING SOFTWARE PROGRAMS FOR APPLE AND IBM/IBM-COMPATIBLE EQUIPMENT

FOR APPLE MACINTOSH:

Program/Company	Price	Memory
Textures/Addison-Wesley Publishing	$495	512k
PageMaker 2.0/Aldus Corp.	495	512k
MacPublisher III/Boston Publishing	295	512k
Mac Tex/FTL Systems	750	1Mb
ReadySetGo/Letraset USA	495	512k
Page One/McCutcheon Graphics	2000	1 Mb
Ragtime 2/Orange Micro	395	512k
PS Compose/PS Publishing	800	1 Mb
XPress/Quark Inc.	695	512k
Command Typographer/Software Shop	495	1 Mb
Scoop/Target Software	495	512k

MS-DOS SOFTWARE FOR IBM:

Program/Company	Price	Memory
Microtek 1.5A/Addison-Wesley	745	512k
PageMaker/Aldus Corp.	695	640k
Archetype Designer 1/Archetype Inc.	3500	640k
Byline/Ashton-Tate	295	384k
Laser-Press/Award Software	495	256k
Power Text Formatter/Beaman Porter	150	384k
Superpage 2.0/Bestinfo Inc.	7000	640k
Document Mgmt. System/Bestinfo	8000	640k
Fontasy/Brown-Waugh Publishing	70	256k
GML/PC / Command Technology Corp.	795	512k
Cyber Type/Cyber Publishing	495	384k
Printrix/Data Transforms Inc.	165	256k
GEM Desktop Publisher/Digital Research	395	512k
DeskSet 1.2/G.O. Graphics	995	512k
DeskSet Design/G.O. Graphics	1995	640k
PagePerfect/IMSI	495	640k
I Print/Indigo Software	350	384k

Table Continued..............

THE COMPUTER PRINTER & PLOTTER MARKET

LIST OF MAJOR DESKTOP PUBLISHING PROGRAMS

(TABLE CONTINUED) PROGRAMS FOR MS-DOS/IBM

Program/Company	Price	Memory
PTW/Itek Graphix Corp.	$7995	512k
The Office Publisher/Laser Friendly Inc.	995	640k
Laser Maker/Laser Maker	1495	640k
LaserSet/Laser Technologies	200	256k
Spellbinder Desktop Publisher/Lexisoft	695	384k
Magnatype/Magna Computer Systems	5250	640k
First Impression/Megahaus Corp.	895	640k
PC Tex/Personal Tex Inc.	249	512k
scLaserPlus/Pursang Corp.	495	320k
PowerForm/The Puter Group	349	640k
PC-Preview/The Puter Group	1495	640k
ScenicWriter/Scenic Soft Inc.	695	384k
PFS-First Publisher/Software Publishing Corp.	99	512k
Newsroom Pro/Springboard Software	79.95	512k
Crystal Publishing System/Syntactics Corp.	895	640k
Timeworks Desktop Publisher/Timeworks Inc.	99.95	512k
NewsMaster/Unison World	99.95	256k
Pagework/West End Films	1450	512k
Pagebuilder/White Sciences Inc.	495	512k
Ventura Publisher/Xerox Corp.	895	512k
Typesetter Interface/XLent Software	50	640k

SOURCE: Personal Computing Magazine (Nov. 1987)

LASER PRINTER MANUFACTURERS

Acer Technologies Corp., 410 Charcot Ave., San Jose, CA 95131

ACOM Computer, Inc., 3534 Atlantic Ave., Long Beach, CA 90807

Advanced Technologies International, 1900 Wyatt Drive, Santa Clara, CA 95054

Apple Computer, Inc., 20525 Mariani Ave., Cupertino, CA 95014

AST Research, 2121 Alton Ave., Irvine, CA 92714

Brother International Corp., 8 Corporate Plaza, Piscataway, NJ 08854

Canon USA, Inc., 1 Canon Plaza, Lake Success, NY 11042

C. Itoh Digital Products Inc., 19750 So. Vermont Ave., Suite 220, Torrance, CA 90502

CIE Terminals Inc., 2505 McCabe Way, Irvine, CA 92714

Citizen America Corp., 2425 Colorado Ave., Santa Monica, CA 90404

Continental Systems Inc., 401Charcot Ave., San Jose, CA 95131

Cordata Technologies Inc., 2001 Corporate Center, Newbury Park, CA 91320

CPT Corp., 8100 Mitchell Rd., P.O. Box 295, Minneapolis, MN 55440

Dataproducts Corp., 6200 Conoga Ave., Woodland Hills, CA 91365

Derex, Inc., 7716 Wiles Rd., Coral Springs, FL, 33067

Digital Equipment Corp., 146 Main St., Maynard, MA 01754

Electronic Form Systems, 2395 Midway Rd., Carrollton, TX 75006

Epson America, Inc. 2780 Lomita Blvd., Torrance, CA 90505

Facit, Inc., 9 Executive Park Drive, Merrimack, NH 03054

Fujitsu America Inc., 3055 Orchard Drive, San Jose, CA 95134

Genicom Corp., One Genicom Drive, Waynesboro, VA 22980

Hewlett-Packard, Boise Division, P.O. Box 15, Boise, ID 83707

IBM Corp., Information Systems Group, 900 King St. Rye Brook, NY 10573

Imagen Inc., 2650 San Tomas Expressway, Santa Clara, CA 95052

Kentech Information Systems, 6 Pearl Ct., Box 78, Allendale, NJ 07401

Kyocera Unison Inc., 3165 Adeline Ave., Berkeley, CA 94703

LaserMaster, Ltd., 7156 Shady Oak Rd., Eaton Prairie, MN 55344

Mannesmann Tally Corp., 8301 South 180th St., Kent. WA 98032

Mitek Systems Inc., 6225 Nancy Ridge Dr., San Diego, CA 92121

Office Automation Systems, Inc., 8352 Clairemont Mesa Blvd., San Diego, CA 92111

Okidata, 532 Fellowship Rd., Mt. Laurel, NJ 08054

Olympia USA, Inc., Box 22, Somerville, NJ 08876

Panasonic Industrial Co., Two Panasonic Way, Secaucus, NJ 07094

Printronix, Inc., 17500 Cartwright Rd., P.O. Box 19559, Irvine, CA 92713

QMS inc., 1 Magnum Pass, Mobile, AL 36618

Quadram Corp., 1 Quad Way, Norcross, GA 30093

Qume Corp., 2350 Qume Drive, San Jose, CA 95131

Ricoh Corp., 5 Dedrick Place, West Caldwell, NJ 07006

Talaris Systems Inc., P.O. Box 261580, San Diego, CA 92126

Tandem Computers, 19333 Valco Pkwy., Cupertino, CA 95014

Taxan USA Corp., Desktop Publishing Div., 8005 Courtney Ct., City of Industry, CA 91748

Texas Instruments, P.O. Box 809063, Dallas, TX 75380

Toshiba America Inc., Information Systems Div., 9740 Irvine Blvd., Irvine, CA 92718

Xerox Corp., Xerox Square, Rochester, NY 14644

DESKTOP PUBLISHING SOFTWARE COMPANIES

Addison-Wesley Publishing Co., Reading, MA 01867

Aldus Corp., 411 1st Ave., Suite 2100, Seattle, WA 98104

Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502

Award Software, 130 Knowles Drive, Los Gatos, CA 95030

Beaman Porter, Inc., 417 Halstead Ave., Harrison, NY 10528

Bestinfo, Inc., 1400 N. Providence Rd., Rosetree Corp. Center, Suite 117, Media, PA 19063

Boston Publishing Co., 1260 Boylston St., Boston, MA 02215

Brown-Waugh Publishing, 16795 Lark Ave., #210, Los Gatos, CA 95030

Command Technology Corp., 1900 Mountain Blvd., Oakland, CA 94611

Cyber Publishing, 5 Science Park Center. P.O. Box 9565, New Haven, CT 06536

Data Transforms Inc., 616 Washington St., Denver, CO 80203

Digital Research, P.O. Box DRI, Monterey, CA 93942

FTL Systems, 234 Eglinton Ave. East, Suite 205, Toronto, Ontario, Canada M4P 1K5

G.O. Graphics, 18 Ray Ave., Burlington, MA 01803

IMSI, 1299 Fourth St., San Rafael, CA 94901

Indigo Software, 1568 Carling Ave., Ottowa, Ontario, Canada K1Z 7M5

Itek Graphix Corp., 34 Cellu Drive, Nashua, NH 03063

Laser Friendly Inc., 930 Benecia Ave., Sunnyvale, CA 94086

Laser Maker, 1117 11th St., Suite 105, Manhattan Beach, CA 90266

Laser Technologies, 15403 E. Alondra Blvd., La Mirada, CA 90638

Letraset USA, 40 Eisenhower Drive, Paramus, NJ 07653

Lexisoft, P.O. Box 1950, Davis, CA 95617

McCutcheon Graphics, 500 Cochrane Drive, Unit A, Markham, Ontario,
Canada L3R 8E2

Magna Computer Systems, 14724 Ventura Blvd., Sherman Oaks, CA 91403

Megahaus Corp., 6215 Ferris Square, San Diego, CA 92121

Orange Micro, 1400 No. Lakeview Ave., Anaheim, CA 92807

Personal Tex, Inc., 12 Madrona Ave., Mill Valley, CA 94941

PS Publishing, 2900 Green St., Suite 1, San Francisco, CA 94133

Pursang Corp., Software Channels Div., 1320 Yonge St., Suite 301, Toronto,
Ontario, Canada M4T 1X2

The 'Puter Group, 1717 W. Beltline Hwy., Madison, WI 53713

Quark Inc., 300 South Jackson, Suite 100, Denver, CO 80209

Scenic Soft Inc., P.O. Box 909, Edmonds, WA 98020

Software Publishing Corp., 1901 Landings Drive, P.O. Box 7210, Mountain
View, CA 94039-7210

The Software Shop, 233 Bedford Ave., Bellmore, NY 11710

Springboard Software Inc., 7808 Creekridge Circle, Minneapolis, MN
55435

Syntactics Corp., 4655 Old Ironside Drive, Suite 400, Santa Clara, CA
95054

Target Software, 14206 Southwest 136th St., Miami, FL 33168

Timeworks Inc., 444 Lake Cook Rd., Deerfield, IL 60015

Unison World, 2150 Shattuck Ave., Suite 902, Berkeley, CA 94704

West End Films, 1825 Q St. N.W., Washington, DC 20009

White Sciences, Inc., 2 West Alameda, Tempe, AZ 85282

Xerox Corp., Xerox Square, P.O. Box 24, Rochester, NY 14692

Xlent Software, P.O. Box 847, Springfield, VA 22150

RECENT PRINTER & PLOTTER MARKET DEVELOPMENTS

This section consists of information obtained from two main sources:

1) Computer-searched business database abstracts of printer and plotter sales forecasts made during the past year (by **other** industry analysts, stock brokers, market research firms, trade journals, etc.)

2) Electronics trade journals/periodicals' articles related to this market

One of the best methods of collecting a wide variety of **current** information about a particular market or industry is to utilize a computerized business database which is continuously updated. Marketdata has performed a custom database search of the Predicast (Dialog/Lockheed) "U.S. Forecasts" file, for articles containing sales/consumption forecasts of computer printer and plotter markets. The search was conducted by a local University Center For Busines Research.

SIC code 35732 (computer peripheral equipment) was used. This search produced a few dozen pertinent abstracts, which were printed off-line, and appear in this section in "bibliographic" form (citing the publisher, date, page number, etc.--for further reference by the reader). By viewing many **other** firms' forecasts, in conjunction with Marketdata's own research, we can arrive at a more accurate "consensus" forecast.

In addition, the second part of this Market Developments section contains a chronologically-arranged listing of selected computer printer and plotter articles (summarized and condensed), that have been extracted from Marketdata's in-house electronics clippings files. The major sources for these articles include.........Electronics, Electronic News, Wall St. Journal, Japan Economic Journal, Computer Reseller, Mini-Micro magazine.

The topics covered include..............

New product introductions
Joint engineering/marketing deals
Technology developments
Company plant production capacities
Acquisitions & mergers
Sales/financial performance reports for vendors
Market size estimates & printer end-use applications
Price increases/cuts
Distribution deals
Foreign trade-import dumping
Company market share estimates

The companies covered in these articles are.........

Apple Computer
Canon
Centronics
C.Itoh
Dataproducts
Datametrics
Delphax
Epson
Facit
Fujitsu
General Business Technology
Genicom
Hattori Seiko
Hewlett-Packard
Hitachi
Honeywell-Bull
Howtek
Imagen Corp.
Interleaf
IBM
Kodak
NEC
Okidata
Primages
Quadram
Qume
Ricoh
Siemens
Storage Technol.
Talaris Systems
Unisys
Zenith
Zentec
Wang

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1219744   Electronic  88/01/07  P66   United States
  Impact Printers. sales. .

          YEAR     mil  $

          1986        4580.
          1987        5130.
          1988        5060.

  GROWTH RATE= 5.2%
  CC=1USA   PC=3573261   EC=652

1219743   Electronic  88/01/07  P66   United States
  Computer Input Output Eqp NEC. sales. (printers).

          YEAR     mil  $

          1986        7439.
          1987        8482.
          1988        8850.

  GROWTH RATE= 9.1%
  CC=1USA   PC=3573260   EC=652

1219742   Electronic  88/01/07  P66   United States
  Plotters. sales. .

          YEAR     mil  $

          1986         897.
          1987        1076.
          1988        1237.

  GROWTH RATE= 17.5%
  CC=1USA   PC=3573257   EC=652

1219741   Electronic  88/01/07  P66   United States
  Computer Optical Eqp NEC. sales. (scanning devices).

          YEAR     mil  $

          1986         786.
          1987         880.
          1988        1012.

  GROWTH RATE= 13.5%
  CC=1USA   PC=3573259   EC=652

1219739   Electronic  88/01/07  P66   United States
  Computer Output Microfilm Systems. sales. .

          YEAR     mil  $

          1986         538.
          1987         565.
          1988         571.

  GROWTH RATE= 3.1%
  CC=1USA   PC=3573254   EC=652

1219738   Electronic  88/01/07  P66   United States
  Computer Optical & Graphics Eqp. sales. (I/O peripherals).

          YEAR     bil  $

          1986          9.8
          1987         11.1
          1988         11.8

  GROWTH RATE= 9.8%
  CC=1USA   PC=3573250   EC=652

1214140   Purchasing  87/11/00  P16   United States
  Laser Printers. retail price. .

          YEAR           $/unit

          1986        3166.

          1988        2166.

  GROWTH RATE= -17.3%
  Dataquest
  CC=1USA   PC=3573263   EC=743
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1219747   Electronic  88/01/07  P66   United States
  Nonimpact Printers. sales. (thermal,electrostatic,etc).

          YEAR     mil  $

          1986        840.
          1987       1535.
          1988       2224.


  GROWTH RATE= 62.8%
  CC=1USA   PC=3573262   EC=652

1219746   Electronic  88/01/07  P66   United States
  Laser Printers. sales. .

          YEAR     mil  $

          1986       1589.
          1987       1923.
          1988       2175.


  GROWTH RATE= 17.0%
  CC=1USA   PC=3573263   EC=652

 1221055   Mini Micro  87/09/00  P26   United States
   Computer Optical & Graphics Eqp. shipments. (multiuse
 scanners).

            YEAR     000  units

            1987        5.40
            1991      161. 0

   GROWTH RATE= 133.7%
   CAP Intnl
   CC=1USA   PC=3573250   EC [illegible]

 1221054   Mini Micro  87/09/00  P26   United States
   Computer Optical & Graphics Eqp. shipments for. publishing
 (scanners).

            YEAR     000  units

            1987       14.30
            1991       95.20

   GROWTH RATE= 60.7%
   CAP Intnl
   CC=1USA   PC=3573250   EC=631
  1214139   Purchasing  87/11/00  P16   United States
    Laser Printers. shipments. .

            YEAR     000  units

            1986        289.
            1988        746.

    GROWTH RATE= 60.7%
    Dataquest
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1221059   Mini Micro  87/09/00  P26   United States
  Computer Optical & Graphics Eqp. shipments. (scanners).

          YEAR     000  units

          1987        25.6
          1991        366.

  GROWTH RATE= 94.5%
  CAP Intnl
  CC=1USA   PC=3573250   EC=631

1221058   Mini Micro  87/09/00  P26   United States
  Computer Optical & Graphics Eqp. shipments for. communicatns
facsimile (scanners).

          YEAR     000  units

          1987        2. 0
          1991       69.50

  GROWTH RATE= 142.8%
  CAP Intnl
  CC=1USA   PC=3573250   EC=631

1221057   Mini Micro  87/09/00  P26   United States
  Computer Optical & Graphics Eqp. shipments for. dedicated
OCR (scanners).

          YEAR     000  units

          1987        3.10
          1991        3.70

  GROWTH RATE= 4.6%
  CAP Intnl
  CC=1USA   PC=3573250   EC=631

1221056   Mini Micro  87/09/00  P26   United States
  Computer Optical & Graphics Eqp. shipments for. CAD
applications (scanners).

          YEAR     000  units

          1987         .80
          1991       36.60

  GROWTH RATE= 160.1%
  CAP Intnl
  CC=1USA   PC=3573250   EC=631
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DIALOG File 81: PTS US FORECASTS - 71-88/Jan (Copr. Predicasts Inc. 1988)

1210225    Appliance  87/09/00  P64   United States
  Point of Sale Terminals. avg life. .

            YEAR          years

            1987          7.

  CC=1USA    PC=3573283    EC=348

1210218    Appliance  87/09/00  P64   United States
  Printing Terminals. avg life. .

            YEAR          years

            1987          5.

  CC=1USA    PC=3573277    EC=348

1210217    Appliance  87/09/00  P64   United States
  CRT Terminals. avg life. .

            YEAR          years

            1987          6.

  CC=1USA    PC=3573275    EC=348

1210216    Appliance  87/09/00  P64   United States
  General Purpose Terminals. avg life. (multi station
CRT/teleprinter).

            YEAR          years

            1987          5.

  CC=1USA    PC=3573274    EC=348

1210215    Appliance  87/09/00  P64   United States
  Impact Printers. avg life. (incl nonimpact).

            YEAR          years

            1987          5.

  CC=1USA    PC=3573261    EC=348

1210213    Appliance  87/09/00  P64   United States
  Floppy Disk Drives. avg life. .

            YEAR          years

            1987          6.
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  CC=1USA    PC=3573216    EC=348

1209586    Comp G Wld  87/09/00  P28   United States
  Computer Optical & Graphics Eqp. sales. (desktop scanners).

            YEAR     mil  $

            1986          70.
            1990        1100.

  GROWTH RATE= 99.2%
  microPublishing
  CC=1USA    PC=3573250    EC=652

1210272    Appliance  87/09/00  P64   United States
  Printing Terminals. sales for. replacement.

            YEAR     000  units

            1987        400.
            1988        460.

  GROWTH RATE= 15.0%
  CC=1USA    PC=3573277    EC=654

1210269    Appliance  87/09/00  P64   United States
  Impact Printers. sales for. replacement (incl nonimpact).

            YEAR     000  units

            1987        560.
            1988        810.

1218304    EDP Weekly  87/11/16  P2   United States
  Impact Printers. consumption. .

            YEAR     bil  $

            1986          9.1
            1987          9.4
            1988         10.3

  GROWTH RATE= 6.4%
  CC=1USA    PC=3573261    EC=656
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CHRONOLOGICAL OVERVIEW OF PRINTER & PLOTTER MARKET DEVELOPMENTS (1986-1988)

2/8/88.......DATAPRODUCTS QUARTER REVENUES FALL 49%

Dataproducts Corp. (woodland Hills, CA) attributed a 49% decrease in 3rd quarter revenues to an increasing share of total sales coming from new products still high on the cost/learning curve. Earnings were $1,083,000, or 5 cents a share, for the 3 months ended Dec. 26, compared to $2,127,000, or 10 cents per share, for the same period of fiscal 1987. Sales were up 7% to $91,171,000, from $84,842,000. For the first 9 months of fiscal 1988, the company lost $5,268,000, against a year-earlier profit of $7,309,000. Sales declined 2% to $249,233,000.

Dataproducts said sales gains for the 3rd quarter were mainly from shipments of laser printers, government and military products. Sales of older, impact printers were down from last year. Company backlog at the end of fiscal 1988 stood at $115 million, up from $105 million a year earlier. The firm has attempted to shift emphasis to laser and ink jet print technology products for the past 2 years.

IBM ADDS TO PRINTER LINE...............(Rye Brook, NY) IBM brought out 4 new printers the first week of February, in an attempt to bolster the impact and non-impact lines offered with its departmental processors and mainframes. Models 3827 and 3835 were introduced (92 and 88 pp. per minute, respectively). They can be used with with IBM's 43XX, 308X, and 309X processors. The 3827 is priced at $185,000, scheduled for 2nd quarter availability. The Model 3835 is priced at $135,000. Both carry minimum monthly maintenance charges.

The 1200 LPM Model 6262-12 and 1400 LPM 6262-14 were also unveiled. The 6262-12 will be marketed for use with 3X74, 9370, 4361, System/3X and System/88 machines. It is priced at $22,600, available in March. The 6262-14 is priced at $26,500, to be released in July

FACIT DISMISSES PRESIDENT & 2 VPs FOLLOWING DISAPPOINTING 1987 SALES............(Merrimack, NH) Facit, Inc. dismissed President Louis D'Amore and two vice presidents (Robert Barbary & Martin Carrier), at the request of Norwegian firm Design Funktion A/S K/S, which is expected to complete its purchase of Facit's core printer operation this week. VP Marketing Michael Robbert replaced the president and messrs. Barbary and Carrier were replaced by Jack Dupre (sales training director) and treasurer

Paul MacDonald, respectively. Facit does not plan to name a new marketing director. The original deal with Design Funktion was restructured to give the Norwegian firm 100% control. The foreign firm last week completed its purchase of Facit's European operations, which market word processing equipment, typewriters, calculators and office equipment.

HONEYWELL BULL ADDS MATRIX PRINTERS............(Waltham, MA) Honeywell Bull, Inc. introduced two monochrome dot matrix printers for use with its personal computers and Unix-based XPS-100 small systems. The new 80-column Model 4/20 and 136-col. Model 4/21 were developed by the firm's Honeywell Bull Italia affiliate. These two models do not replace other units. The new models can accomodate spreadsheets and wide forms. 20 different fonts are available, incl an extended IBM character set. Pricing starts at $645 for the Model 4/20 and $899 for the 4/21, and both printers are available immediately.

2/1/88............HEWLETT-PACKARD UNVEILS DESKTOP PRINTER, RIVALING COSTLY LASER MODELS

HP (Palo Alto, CA) unveiled a desktop printer priced at $995, that produces document quality and rivals state-of-the-art laser printers three times the price. The HP DeskJet for personal computers is smaller than a briefcase and prints two high-quality pages of text or graphics a minute. A Dataquest Corp. analyst said he wouldn't be surprised if HP sold 100,000 units in the first year. At half the retail price (to dealers and distributors) that would amount to $50 million. The DeskJet employs ink jet technology, and is made from scratch at the firm's Corvallis, OR plant. The main drawback with the DeskJet is speed, much slower than many laser printers (at least 7 pp. per min.).

1/18/88.................APPLE REVAMPS LASER PRINTER LINE

Apple Computer (Cupertino, CA) last week recast its Laserwriter line of laser printers with 3 new models, based on Motorola's 68000 series microprocessors. The Laserwriter II SC is a single user model featuring 1 MB of RAM, and emulates the Diablo 630. It is priced at $2,799 and is slated for February availability. The new Laserwriter II NT is a networkable version of the printer which can be configured with IBM-compatible units as well as Macintosh. It offers 2 MB of RAM, 1 MB of ROM and 35 built-in typefaces. It is priced at $4,599, with immediate availability.

At the high end, Apple brought out the Laserwriter II NTX, based on the 32-bit 68020 MPU. It features 2 MB of RAM expandable to 12 MB, 1 MB of ROM, and Diablo 630 emulation. It is priced at $6,599, slated for March availability. All new models are based on the 8-page-per-minute Canon LBP-SX print engine. Each can be upgraded to the next model. The new printers replace Apple's old Laserwriter and Laserwriter Plus units, which it will continue to service and support.

ZENTEC AGRESS TO ACQUIRE QUME.................(Santa Clara, CA) Zentec Corp. last week signed a letter of intent to acquire Qume Corp., a move aimed at boosting its sales through distributors. The agreement also gives Zentec a potential avenue into the graphics terminal market, which it sought to enter in 1986 through the purchase of Qume's technology. The agreement represents the second attempt in the last 5 months by Zentec to expand its marketing focus past its traditional OEM base. A proposed purchase of Zentec by TeleVideo fell through.

Zentec has not decided what to do with Qume's printer business, which markets daisywheel, dot matrix and laser products. The Qume name is to be kept on all the products Zentec retains. While 18% of Zentec sales come from European accounts, Qume sold about 30% of its products in Europe last year. The acquisition of Qume would provide Zentec with a unit which analysts said posted $115 million in sales last year for parent company Alcatel N.V. Qume shipped a total of approximately 80,000 terminals and printers last year and sold 80% of its terminals through the distribution channel. The value of the agreement between Zentec and Qume was not disclosed.

Zentec, meanwhile, posted sales of about $30 million last year, with 60% of its sales going to OEM accounts. The firm shipped 50,000 terminals last year. Zentec's manufacturing facilities are located in Mexico, while Qume manufactures at two locations in Korea and Taiwan. The proposed acquisition is subject to signing a definitive agreement and approval by boards of both firms, expected within 45 days.

1/7/88........NOW APPLE'S MACINTOSH CAN TALK TO A PLOTTER

Apple Computer's fight to gain acceptance for its Macintosh PC from engineers and scientists is getting a lift. One problem the MAC has faced is that, until now, it could not be used with most engineering plotters. But IOtech Inc. of Cleveland, OH has developed a $495 interface card that lets the MAC talk to any plotter equipped with an IEEE 488 or HP-IB/GPIB interface. Combined with MacPlot software, a $395 desktop utility that converts the Mac screen to the HPGL or compatible plotter graphics language, the board lets programs such as MacPaint run directly on plotters.

12/14/87............UNISYS TO BUY NEW-TECHNOLOGY PRINTERS FOR COMPUTERS, BOOSTING DELPHAX LINE

Unisys Corp. (Blue Bell, PA) has agreed to buy $50 million of ion deposition printers from Delphax Corp. of Randolph, MA. Delphax, a joint venture owned by Dennison Manufacturing Co. of Waltham, MA and Xerox of Stamford, CT, has been selling versions of the new printers for four years, but has captured only a small share of the fast-growing $3.25 billion market for non-impact printers, which is dominated by laser printers.

Under the agreement, Unisys will buy the printers over the next three years, add software and packaging, and resell them as the Unisys B9275 for $82,000 each. The printers will be sold to Unisys customers for high-speed printing at 75 pages/mi. in data processing centers and offices. They are expected to replace aging, noisy line printers and compete with high-speed laser printers made mostly by Xerox and IBM. Delphax printers handle **single** sheets of copier paper, as opposed to fan-fold perforated paper. Delphax has been selling versions of the printers to other companies, including Xerox and Honeywell-Bull, which then resell them. This year (1987), Delphax expects to sell about $42 million of the printers.

Independent consultants say that this ion deposition technology is less expensive and more reliable than laser printers, because the paper moves in a shorter path. reducing jams, and the printer has about one-third the number of moving parts of a laser unit.

10/12/87........WANG RELEASES 5 NEW PRINTERS.........Wang Labs (Lowell, MA) added a laser printer and a dot matrix printer for its PCs, and a trio of line printers for use with its VS processors. In the PC area, the Model LDP8 laser printer was introduced, with 8-page/min. speed and HP's PCL printer command language. Also, the Model DM50/300 was added, a 9-wire dot matrix unit. The LDP8 and DM50/300 function with Wang's PC, APC and new PC 200/300 personal computers, as well as the IBM PC. The LDP8 is priced at $3,000, scheduled for late October shipment, while the DM50/300 unit is priced at $995 and available immediately. For the VS Series, Wang brought out three new models supplied by Printronix, the LN400 ($12,000, prints up to 400 lpm), the LM700 at $14,000 (700 lpm), and the LN900 at $18,000 (900 lpm).

10/5/87................CENTRONICS TO ACQUIRE EKCO FROM GIBBONS IN $124 MILLION PACT..........Centronics Corp. (Nashua, NH) said it agreed to acquire Ekco Group Inc. from Gibbons, Green, van Amerongen and other holders for $124 million. Centronics, a shell company that sold its computer printer business early in 1987, has been searching for new acquisitions. Centronics expected to complete the purchase within a month. In the fiscal year ended June 30, Ekco had earnings of $13.7 million before interest and taxes, on revenues of $110.6 million.

9/14/87..........FACIT PRICES CUT ON PRINTER LINE.........Facit Inc. (Merrimack, NH) cut prices of its B-Line dot matrix printers up to 17%, with the deepest cuts affecting the high-end model B3350. The color version was cut from $1,265 to $1,040, while the black & white model was dropped from $1,195 to $995. Also, the entry-level Model B31000 was reduced from $745 to $695. The color B3150 was cut from $1,065 to $965, and the black & white version from $995 to $895.

9/14/87...........QUADRAM LASER PRINTER TO USE ADOBE POSTSCRIPT

Quadram (Norcross, GA) reached an agreement to license Adobe Systems Inc.'s PostScript language for use in a new laser printer. The QuadLaser PostScript was sceduled for shipment in November 1987, with a price tag of $3,995. It is based on a Ricoh engine, has 35 fonts and an 8-page/min. print speed.

HONEYWELL BULL MODIFIES PRINTER...........Honeywell Bull's Italian subsidiary has extended the capabilities of the Bull 4/66 color dot matrix printer. Features added include bar code printing, automatic front loading of single sheets and pull tractors. Production of the original 4/66 model has been halted, although worldwide marketing continues. The new model is priced at $2,400. Its form length has been increased from 21 to 24 inches, to allow for the handling of a greater range of paper sizes. The printer will continue to be made at Honeywell Bull's Caluso, Italy plant.

9/7/87..............DATAPRODUCTS & UNISYS IN $65 MILLION PACT

Dataproducts signed a $65 million contract with Unisys Corp., calling for the printer maker to ship its LB Series of band printers. The contract specifies printers to be used with Unisys' A, V and 1100 Series mainframes, and supersedes an older agreement calling for shipment of Dataproducts' B Series band printers. Under previous agreements, Unisys purchases three models of Dataproducts' 8000 line of serial dot matrix printers. The number of units involved was not disclosed.

8/24/87.................EPSON SHIFTS PRICES ON PRINTERS

Epson America (Torrance, CA) revamped its printer price schedule, increasing tags of its 9 and 24-pin dot matrix printers up to 14%. All of

Epson's 9-pin offerings increased in price, with the low-end LX shifting from $269 to $299, the FX-86E from $499 to $549, and the FX-286E from $699 to $799. Also increased were prices on the 9-pin EX series. The EX-800 from $599 to $649, and the EX-1000 increased from $79 to $899. In high-end printers (24-pin dot matrix), the LA-2500 went up 3%, to $1,499, wile the low-end LQ-800 was reduced from $699 to $599. The company said that price increases for printer products were tied to the strength of the yen.

8/10/87................DELPHAX FORMS 3 PRINTER UNITS

Delphax Systems (Randolph, MA) has created three new divisions to oversee development and manufacturing of its printers, basing the new units on product lines. The division includes the firm's high-speed and mid-range printers, in addition to its printer components business. The High Speed Systems division includes the S6000 and S6000-2 printers. The Mid-Range Printer Systems division includes the 30-page-per-minute Model S3000. The Components division includes the firm's print cartridges, dielectric cylinder, and erase rod. The reshuffle was needed for better management of Delphax's growth. The firm's annual sales grew from $18 million in 1985 to $35 million in 1986. The firm projected 1987 revenues of $50 million, according to President Gary E. Sharpe.

7/20/87...........DOT MATRIX PRINTER ADDED BY OKIDATA

Okidata (Mt. Laurel, NJ) introduced a 4-speed model, with print speed of 450 cps in draft mode. The new model is named the Microline 393, and is being positioned at the high end of the firm's 24-pin dot matrix line. It is priced at $1,499 for a color version and $1,399 for black & white. Availability is immediate.

7/18/87..........DATA TECHNOLOGY TO OBTAIN LIQUID CRYSTAL SHUTTER PRINTER FROM CASIO ON OEM BASIS (Japan Econ. Jrl., p.17)

TWO LASER PRINTERS MARKETED BY NEC

NEC Information Systems (Boxborough, MA) has expanded into the laser printer market with a pair of models offering 22 and 30-page-per-minute speeds. Both the 30-ppm LC-3300 laser printer and the 22-ppm LC-3400 model list for $10,995. New versions of both models with Hewlett-Packard Laserjet compatibility will be shipped later this year, at a $14,995 list. Meanwhile, NECIS expanded its Pinwriter line at the low end and high end with the P2200 and P8300 models, respectively. The P2200 is priced at $499 and the P8300 at $2,795.

June 1987.............OF PRINTERS BOUGHT FOR HOME IN 1986, 21% WERE SOLD BY DEPT. STORES, ELECTRONICS STORES & OTHER OUTLETS (Mart, June 1987, p.26)

6/25/87........COLOR PRINTER HITS 200 LINES A MINUTE

Datametrics Corp. engineers have come up with a smart color printer for military applications that runs at 200 lines/min. yet produces near-photographic-quality output of 40,000 dots/sq. in. The DcM 1900 takes just 45 sec. to print more than 4 million dots on a 10.25-by-10.5-in. page, using thermal-transfer technology and a standard 3-color yellow, magenta, and cyan ribbon. That rate is three time faster than competitive color printers.

6/8/87............CANON REVAMPS LINE OF LASER PRINTERS

Canon U.S.A. (Lake Success, NY) has reshuffled its laser printer line, repackaging two previous models in a single version. The new model is an 8-ppm offering dubbed LPB-811. It uses the producer's own engine, features 512K KB of memory, expandable to 2 MB, and is priced at $2,500, scheduled for June availability. Canon will stop making the older models (LPB-8A1 and LPB-8A2), but would not specify when production would cease.

OKIDATA CUTS TAG ON LASER PRINTER

Okidata (Mt. Laurel, NJ) reduced the price of its 6-ppm Laserline 6 laser printer by $200, from $1,995 to $1,795. The company stated it positioned the product to compete with daisywheel and letter-quality printers. "Someone looking for a daisywheel printer wants to spend under $2,000." The firm maintained that price reductions were not a result of sluggish sales.

5/25/87................SIEMENS OFFERS UPDATED LASER PRINTERS

Siemens Information Systems (Anaheim, CA) brought out updated versions of its high-speed 2200 and 2300 offerings that incorporate all-points addressability (APA) and advanced function printing (AFP). The new units are designed for on-line use with all IBM and plug-compatible mainframes as replacements for IBM's 3800 laser printer. The 103-page-per-minute, cold-fusing model 2200 lists for $189,000 and is slated for third quarter availability, while the 206-ppm, thermo pressure-fusing Model 2300 is priced at $283,500, slated for 4th quarter shipment. Additional 2200 and 2300 features include a $95,000 paper processing option, and a $5,695 host-based application software product dubbed Forms Generation Systems, which allows generation of electronic forms under the OS MVS and DOS VSE operating systems.

5/25/87................HP PRINTERS TO USE QMS CONTROLLERS

QMS Inc. (Mobile, AL) has signed a contract to provide intelligent graphics controllers for use in Hewlett Packard's line of dot matrix printers. HP printers bundled with QMS Magnum controllers will be marketed to users in the retail and health care industries for use in bar coding applications

5/18/87..............FUJITSU ADDS ITS FIRST LASER PRINTER

Fujitsu entered the North American non-impact printer market with an 18-ppm model based on an in-house developed print engine. Model M3727MA includes emulation of Epson FX80, Diablo 630 and HP Laserjet plus printers. The standard printer is priced at $7,950, and volume production was slated for the 3rd quarter. In the impact area, Fujitsu added two 24-wire models and two 9-wire offerings. The 24-wire models, designated DL3300 and DL3400, offer emulation of the IBM Proprinter XL, the IBM Graphics Printer and the Diablo 630 API. Prices are $795 for the DL3300 and $995 for the DL 3400. The DL300 will begin shipping in July, while DL3400 is available now. Two 9-wire dot matrix models--the 80-col. DX2300 and the 136-col. DX2400, also were introduced. The former is priced at $645, the latter $845.

LASER PRINTER ADDED BY C. ITOH DIGITAL

C. Itoh Digital Products (Torrance, CA) has expanded its printer line, adding a PC-compatible laser model aimed at general business applications. The JetSetter provides emulation of HP's LaserJet Plus, the Diablo 630 and the Epson FX-86E. I has a print speed of 5 -ppm, 512K memory, and 1.5 MB memory expansion option. The standard configuration is priced at $1,795, and is scheduled for July availability.

May 1987.........IMPACT MATRIX PRINTER SHIPMENTS WILL TOTAL 4.5 MILLION UNITS IN 1988 (Mini-Micro, May 1987, p.149)

5/4/87.......LASER PRINTERS GAIN IN OFFICE ACCEPTANCE

Laser printers are gaining widespread acceptance in central office applications by offering superior price/performance to existing line printers, while being capable of handling the expanded graphics now being required by certain users.

Users are moving away from the printer-per-desk layout and looking more closely at shared applications. The continuing decline in laser printer prices at both the high and low ends has allowed it to move, in certain situations, from being a graphics-specific system to one used for typical data processing tasks. Montgomery Ward, K-Mart, Continental Illinois Bank and the Mutual Of Omaha Insurance company are following current trends by using laser printers for their mainframe computer applications, while using dot matrix models for more widespread PC applications.

K-Mart (Troy, MI) has deployed a number of laser printers, but soon may install a high-speed centralized laser printer in each store. Those installations would be due to a committment to begin adding token-ring local area networks this year at all of its 2,100 locations. Management stated: "It's very likely that 5 years from now if you look at our stores, you will see at least five dot matrix printers that were dedicated to at least five PCs replaced by one high-speed laser printer." K-Mart expects that the crossover point between multiple dot matrix printers and a single laser printer to be substantially lower 2 years from now than what it is now.

Montgonery Ward, meanwhile, which uses laser printers with its mainframe computers and dot matrix models with its PCs, also is evaluating shared printer applications for its 500 stores.

4/20/87..........EEC BEGINS INVESTIGATION OF JAPAN PRINTER DUMPING

(Paris).....The global dispute over Japanese electronics exports intensified last week as the European Economic Community opened an inquiry into Japanese dumping of computer printers. The EEC action on printers is aimed at dot matrix and daisywheel machines, but not laser printers. The EEC said Japanese sales of dot matrix printers in Europe reached 1.5 million units in 1986, up from 255,000 units in 1983, while its market share rose from 52% to 74%. European producers saw their share slip from 35 to 11% over the same period.

For daisywheel printers, Japanese sales rose from 140,000 units to 195,000 units from 1983 to 1986, while market share rose from 70% to 74%. The European share fell to 7.5% from 12% in that same period. Last week's action was spurred by a complaint from Europrint, a manufacturers association led by Olivetti, which claimed that dumping margins were 50% for daisywheel printers and 40% for dot matrix printers. As many as 35 Japanese companies could be affected by eventual duties.

4/13/87.........INTERLEAF ALTERS PRINTER FOR RT PC

Interleaf, Inc. (Cambridge, MA) has added IBM RT PC compatibility to its LPR-308 and LPR-326S laser printers in a move to market the offerings to users of RT PC-based desktop publishing systems. Prices are $8,000 for the LPR-308 and $2,500 for the LPR-326S. The two printers are driven by IBM's RT Publishing software package. IBM-compatible versions of the LPR-308 and LPR-326S, both of which offer 300 dpi resolution, are available immediately.

STORAGE TEK OFFERS LOW-END PRINTER

Storage Technology Corp. (Louisville, CO) last week brought out a low-end version of its 5000 Series high-speed impact printer, capable of operating at a maximum speed of 2,100 lpm. The Model 21 uses a single hammerbank and stainless steel print band with 576 characters. First shipments were to begin by the end of April, and the unit is priced at $35,000. The printer can emulate the IBM 3211, 4245 and 4248 impact printers, Storage Tek said, and is compatible with IBM 370, 3000, 4300, 9300 Series printers.

4/6/87...........TALARIS SYSTEMS ADDS TWO LASER PRINTERS

Talaris Systems Inc. (San Diego, CA) brought out two new models of its 800 family of 8-ppm laser printers, featuring an upgraded version of Canon's LPB print engine. The Model 802 and Model 812 are said to have improved paper handling capabilities resulting from Canon's LPB-CXD engine. The new offerings are IBM-compatible and provide Qume Sprint, Epson FX-80 and Diablo 630 emulation. The Model 802 is priced at $4,950, while model 812 is priced at $7,990. Both models are available immediately.

4/4/87...........CANON VIRGINIA TO BEGIN PRODUCING 10,000 UNITS/MONTH OF LASER BEAM PRINTERS IN JUNE 1987 **(Japan Economic Journal, p.17)**

3/2/87..............CONSULTING FIRM SAYS SALES LOOK DIM FOR NEW COLOR PRINTER

Buyers are likely to be stunned by the cost of the new color laser printers--expected on average to run $15,000 for the least sophisticated models--according to a study by International Resource Development Inc. of Norwalk, CT. Black & white laser printers start at $1,500. However, price will not be the only reason for a cool reception. With only 7 colors available, the selection is seen as too limited. Also, bleeding colors and fuzziness and dissapointing resolution are other drawbacks. Colorocs Corp., a Norcross, GA start-up, is expected to be the first firm out with a color laser printer. Other companies such as Canon U.S.A. (Lake Success, NY) are expected to follow soon.

2/23/87...............(Source: Comp. Reseller, p. S6)

APPLE COMPUTER ACCOUNTS FOR 28% OF LASER PRINTER DOLLAR SALES IN 1986, AND HEWLETT-PACKARD ACCOUNTS FOR 69%

LASER PRINTER MARKET TOTALLED $196.9 MILLION IN YEAR ENDED 11/86 VS. $138 MILLION IN FY ENDED 12/85

LASER PRINTER MARKET WILL REACH $4.4 BILLION IN 1990, UP 31% PER YEAR VS. $1 BILLION IN 1985

LASER PRINTERS NOW USED BY 10-15% OF THE PEOPLE PRINTING LEGAL DOCUMENTS

2/2/87.........ARTS COMPUTER PRODUCTS....NEW DAISYWHEEL PRINTER CAN ALSO BE USED AS BRAILLE PRINTER

12/15/86.........STAR MICRONICS INTRODUCED 5 NEW DOT MATRIX PRINTERS WITH TOUCH-PAD CONTROLS

11/27/86......SOLID INK PRINTER OFFERS LETTER-QUALITY OUTPUT

A printer from Dataproducts Corp. with an innovative solid-ink technology achieves letter-quality output while eliminating two of the problems that have long plagued ink-jet printers--clogged printheads and an inability to print on all paper types. The $2,795 SI 480 uses solid ink in pellet form and an innovative printhead that can achieve letter-quality printing at both 200 and 400 characters/sec. The SI 480's primary application will be as an upgrade for office systems. Since nozzle clogging due to evaporation is eliminated, printhead reliability is high--averaging 24 months between failure at a 25% duty cycle. Another factor is the "drop on demand" scheme that feeds ink to the printhead only when it is needed.

10/29/87...........GENICOM TO ACQUIRE ASSETS OF CENTRONICS

Genicom Corp. said it agreed in principle to acquire Centronics Data Computer Corp.'s computer printer-related assets and Momentum Technologies Inc. in separate transactions, with a total value of about

$120 million. The transaction will mark a consolidation in the fragmented, generally unprofitable U.S. computer printer business. Genicom's president (Curtis W. Powell) said the transactions, when completed, would make Waynesboro, VA-based Genicom the biggest independent printer company in the U.S., with annual revenue excedding $500 million. Genicom earned $2.4 million, or 21 cents a share, on sales of $39.3 million in the 3rd quarter.

Genicom said it agreed to buy the Centronics assets for about $75 million cash. Centronics had net income of $648,000, or 5 cents per share, on sales of $126.3 million last year. Genicom said it will swap 4.9 million common shares, valued at about $45 million, for all the shares of closely held Momentum. It also agreed to assume $81 million of Momentum debt. Momentum, based in Parsippany, NJ, has annual sales of $165 million. Completion of the transaction requires a definitive agreement and shareholder and regulatory approval.

9/15/86...........NBI & RICOH SIGN PRINTER OEM DEAL

NBI (Boulder, CO) has signed an OEM deal with Ricoh Corp. for laser printers and is evaluating several high-resolution terminal display offerings as part of a series of upgrades to its electronic publishing offerings. The agreement with the Japanese firm's West Caldwell, NJ affiliate calls for use of the Ricoh 4080 table-top laser printer combined with an NBI-built 68000 MPU-based raster image processor to output documents created on NBI 5000 series electronics publishing systems. The printing system, priced at $6,995 for both the printer and processor, will also work with other producers' systems, said NBI. A complete system with the new display, to be designated the 5000S, will be priced at $12,990, with availability of the new screen and system set for the 1st quarter of 1987.

9/8/86............EASTMAN KODAK ADDS LED PRINTER

Eastman Kodak Corp. las week entered the non-impact printer market with the introduction of a LED printer designed around the firm's Keeps electronic publishing system brought out 15 months ago. The Ektaprint 1392, which uses an LED array imaging source with 300 X 300 dpi resolution to print up to 92 ppm, will be priced under $200,000. Kodak also expects to push the new printer into the data processing market and is seeking OEMs for the product.

Unlike laser printers which use rotating mirrors, the LED array image writer prevents distortion by remaining stationery and covering the whole length of the photoconductor, Kodak said. The light bar, consisting of 3,500

LED elements, images characters instead of the background, and is designed to provide sharper images.

8/25/86...........HIGH-SPEED PRINTER ADDED TO OKIDATA LINE

Okidata (Mt. Laurel, NJ) has added a high-speed version to its Microline 290 Series of printers that is said to operate at 400 cps in utility mode. At the same time, the firm enhanced the performance and raised the prices of its other 290 Series printers introduced last April. The Model 294, like the previously introduced 292 and 293, uses a dual 9-pin printhead, which allows single-pass printing of 400 cps in utility mode and 100 cps for near letter-quality. The 294 price is $1,499.

7/21/86.........CENTRONICS ADDS LOW-END LASER PRINTER

Centronics Data Computer Corp. (Hudson, NH) made its long-awaited entry into the non-impact printer market with the introduction of a low-end laser printer supplied by Sharp Corp. Centronics also added a pair of low-end models to its Printstation line of serial dot matrix printers. Volume shipments of the 8-ppm PagePrinter 8 model, to be manufactured in Japan by Sharp, are slated to begin in September. The PagePrinter 8 includes a Motorola 68000-based controller, 256K memory, 300 X 300 dpi, and Diablo 630, 630 ECS, Epson FX, and IBM PC Graphics and Proprinter emulation capabilities.

7/14/86.........CENTRONICS PLANNING TO MARKET PRINTER LINES THROUGH VARs

Centronics, blaming an industry-wide slowdown in OEM orders, last week outlines plans to begin marketing its printer lines through value-added resellers and dealers. The new Preferred Reseller Support Program (dubbed Prosper) was made due to industry trends. About 75% of Centronics' printer sales are currently made through OEMs, with the remainder via distributors. The firm's OEM business suffered a major setback early this year with IBM's decision not to renew an OEm agreement to remarket a specially configured Centronics Printstation 350 dot matrix printer. The OEM contract with IBM accounted for $65 million, or 30%, of Centronics' fiscal 1985 sales of $216.3 million.

The program will initially target IBM VAR and VAD markets and then study other opportunities like the Altos multi-user environment. The firm expects to sign VAR agreements with 100 vendors by Jan. 1987. The VAR program will offer discounts between 30 and 40%, depending on the committment the VAR is willing to make, as well as inventory management, support and cooperative advertising programs. Meanwhile, Centronics signed a multi-year licensing agreement with ROM Control Data, Bucharest, Romania, calling for the latter to manufacture Centronics' E-Series line of band printers. These printers will be marketed by Centronics throughout European Common Market countries.

7/7/86............SPERRY ADDS PRINTER TO HITACHI OEM PACT

Sperry Corp. (Blue Bell, PA) last week added an impact line printer to the list of products it is marketing under a previously disclosed OEM contract with Hitachi Ltd. Late last year the two firms agreed on a joint development effort and OEM agreement to integrate Hitachi technology into Sperry's Series 1100 architecture. Last week, Sperry brought out the 0770-II, 2,000 lpm printer, also manufactured by Hitachi. Priced at $60,000, the 0770-II will be available in the 4th quarter.

IMAGEN SETS SHIPMENTS OF NEW PRINTERS

Imagen Corp. (Santa Clara, CA) will begin shipping in August a new printer line integrating Canon and Xerox laser print engines with its ImageServer XP iamge processors. The Model 7320, priced at $32,950, is based on a 20-ppm Canon LBP-20 engine. The 4324 is based on the 24-ppm Xerox XP-24 laser engine, and lists for $29,950. The desktop 2308 incorporates Canon's LBP-CX 8-ppm engine and is priced at $8,950. All of Imagen's new XP series printers support Unix, DEC, VMS and IBM 3270 host environments, in addition to Ethernet, IBM 2780/3780 and IBM 3270 coax connections.

6/30/86...........PRIMAGES & ZENITH IN PRINTER DEAL

Primages (Lake Ronkonkoma, NY) said it has been selcted by Zenith Data Systems to supply printers and paper handling equipment under a $242 million government contract Zenith has received. Zenith Data was to supply the Air Force Computer Acquisition Center with its 80286-based systems. Primages expects initial sales to exceed $10 milion over the next year.

6/9/86......GBT INTRODUCES NEW ION PRINTER

General Business Technology (Irvine, CA) has introduced a 30-ppm ion deposition printer for use with the IBM System 34/36/38. The Model 6640XP, which lists for $14,995, becomes the second ion deposition printer GBT sells. GBT, which at one time purchased such printers from Southern Systems Inc. of Clearwater, FL, said it is now dealing directly with ion deposition engine maker Delphax Systems, under an OEM agreement of undislosed value.

6/2/86..........TEXAS INSTRUMENTS INTRODUCES TRIO OF LASER PRINTERS

Texas Instruments has entered the laser printer market with a trio of Ricoh-based units scheduled for delivery late this year. The 15-ppm model 2015, priced at $5,995, has a maximum duty cycle of 25,000 pages per month, TI said. The model 2115 and 2108 printers support the Adobe System Inc., PostScript page description language, allowing users to print pages that integrate text, graphics and scanned images. The 2108 is priced at $5,995.

5/19/86.........HOWTEK LAUNCHES COLOR INK-JET PRINTER

Howtek Inc. (Hudson, NY), following a 27-month development effort, has brought out a color ink-jet printer based on its proprietary Thermo-Jet technology. The printer is manufactured by Tokyo Juki Industrial Co. Ltd. under a 10-year development and manufacturing agreement signed by the two firms in late 1984, shortly after Howtek completed an initial public offering. The Pixelmaster printer lists for $2,995, with OEM quantity shipments scheduled for September.

4/28/86.........HATTORI SEIKO ADDS DOT MATRIX PRINTER

Hattori Seiko Computer Peripherals (Allendale, NJ) has introduced a 300-cps dot matrix printer with a color option. The new Seikosha MP-1300AI printer lists for $799 in single quantity. A color version is priced at $954. Hattori Seiko is a division of Hattori Corp. of America. Hattoori Seiko's computers are made in Japan at Hattori America's parent.

4/21/86..........IBM INTRODUCES WIDE-CARRIAGE VERSION OF DESKTOP PRINTER

IBM (Rye Brook, NY) last week brought out a wide-carriage version of its year-old desktop Proprinter that includes a 3-button operator panel to change print characteristics. The new Proprinter XL, or model 4202, can print a line 13.6 in. long. The printer can accomodate cut sheets or multi-part forms up to 16.5 in. wide, and continuous-form paper up to 15 in. wide. IBM's Proprinter and Proprinter XL were both developed by, and are being manufactured at, its Information Products Division, Charlotte, NC. The wide-character XL is priced at $799, while the standard Proprinter has a list price of $549.

4/21/86.......3RD LASERJET PRINTER INTRODUCED BY HEWLETT-PACKARD

HP (Palo Alto, CA) introduced a third model of its LaserJet printer, the LaserJet 500 Plus, priced at $4,995. It offers two, 250-sheet paper-input bins and an output bin that can hold up to 250 sheets. With the exception of the paper handling capabilities, the LaserJet 500 Plus is the same as the LaserJet Plus printer.

3/24/86...........JAPANESE PRINTER WILL TURN OUT COLOR PHOTOS FROM VIDEO SIGNALS

Hitachi Ltd. (Tokyo, Japan) will offer the domestic market full-color printers that can produce--on the spot--high-quality photographic prints from video signals supplied by a TV, video cassette recorder, personal computer, or videotext terminal. Hitachi will offer three models, all printing images equal to 468 TV lines, with 512 pixels per line. In some 80 seconds, the machine can print a picture about 3 by 3.8 in. on paper measuring 4 by 5 in., with a resolution of 152 dots/in. Hitachi will also offer a video disk drive capable of storing 50 still images on a 2-in. floppy disk.

3/10/86..........PRIIMAGES UNVEILS DAISYWHEEL PRINTER

Primages Inc. (Bohemia, NY) has unveiled a 100-cps, fully-formed character printer that utilizes a 100-spoke daisywheel to output text and graphics. Designated the Primages 100 Daisygrapher printer, the unit is priced at $1,895 in single quantity. The printer, which features a stepper motor, is made at the company's Taiwanese subsidiary.

COMPUTER PRINTER & PLOTTER END-USER MARKETS AND DEMOGRAPHIC TRENDS

OVERALL TRENDS IN MAJOR WHITE COLLAR/OFFICE MARKETS

The U.S. Bureau of Labor Statistics reported that the American labor force required 10.96 million workers in **office** occupations as of 1985, compared to 8.05 million in 1974. This is a 36% expansion over the decade. Following were the BLS projected requirements, for selected office occupations..........

Secretaries, stenographers	4,860,000
Typists	1,400,000
Bank clerks	718,000
Bank officers	333,000
Bank tellers	377,000
Insurance agents, brokers, underwriters	536,000
Accountants	995,000
Lawyers	490,000
Public relations workers	134,000

Some 1995 projections for other white collar sectors are also furnished by the BLS.................

	1982	1990	1995	Avg. Annual Growth, 1990-95
	(Number Employed-Thousand)			
Banking	1,655	1,954	2,120	1.6%
Credit agencies	1,038	1,350	1,518	2.4
Insurance	1,870	2,169	2,272	0.9
Miscellaneous business	3,743	5,172	6,183	3.6
Government	15,803	16,750	17,230	0.6
Miscell. professional	2,147	2,640	3,004	2.6

The Census Bureau's quinnenial Census of Service Industries reported that persons employed by the sector known as: "management, consulting and public relations services" grew from 81,902 in 1972 to 143,800 by 1977 and 267,913 by 1982. No doubt, with the rising popularity of the entrepreneur in today's economy, this number will rise significantly with the publication of 1987 census figures.

In the **banking** sector, the actual number of savings **institutions** has declined from 4,677 in 1972 to 3,550 by 1984. But the number of ***offices*** has risen, as follows:

1972	11,643
1975	16,161
1978	20,498
1980	23,575
1981	24,667
1982	24,727
1983	25,010
1984	25,019

New business formations/new incorporations have also increased..........

1975	326,000
1978	478,000
1981	582,000
1984	635,000

All of the above statistics point to the fact that more new and replacement office machines will be needed to satisfy the demands of these workers. **Individual workers** such as secretaries, lawyers, accountants, bankers, stock brokers, real estate agents, insurance agents, and others need personal computers and printers, typewriters, word processors, calculators, dictating machines, etc.

SMALL BUSINESS AND PERSONAL COMPUTERS

Sole proprietors and small business owners now working at home need much of the same equipment-calculators, personal copiers, typewriters, computer printers, etc. but on a smaller scale than corporate America. All are concerned with getting the best value for their money, and buying machines that incorporate the latest technology, which hopefully will increase their productivity and ability to meet workloads. Good time management and fast response time/customer service is critical in today's business environment. Due to heavy merger activity in large corporations, and staff cut-backs at many more in an effort to trim costs and remain competitive, **remaining** employees are being asked to handle larger workloads. Business machines that help them achieve this will be welcomed.

Personal Computing magazine, in its monthly "Data Bank" page, reports some interesting findings related to small business usage of computers (Sept. 1987). They find that more than 50% of small businesses (those with 5-99 employees), rely on personal computers. In fact, PCs are said to be more prevalent in small business than electronic typewriters. Following are their findings.........

As of September 1987, by company size...........

	Number of Employees			
	5-9	10-19	20-49	50-99
The % of small businesses planning to buy a PC in the next year...............	14%	16%	16%	23%
The % of people, by office position, who have final approval on buying computers				
Owner	40	33	22	11
President	18	22	15	13
Vice Pres.	6	7	7	4
Genl. Mgr.	7	8	11	12
Controller	5	4	8	13
Office Mgr.	16	12	14	14
No single person	6	8	14	13
Other	2	6	9	20
The % of small business using various types of office equip.				
Personal computers	49	54	61	68
Printers	**44**	**54**	**59**	**64**
Electronic Typewriters	36	42	49	63
Facsimile machines	9	11	12	23
Dedicated word processors	5	12	14	23
PC-based LANs	5	5	8	9

In addition, Personal Computing found that 16% of small businesses expected to buy personal computers in the next 12 months, 11% planned to buy printers, 9%-electronic typewriters, 3%-facsimile, 2%-dedicated word processors, and 2% planned to purchase PC-based LANs.

Personal Computing (Dec. 1987) also cites a survey by Comtec Market Services (Stamford, CT). This survey found that businesses of all sizes plan to buy 2.8 million computers in 1987 and 1988, with the lion's share going to businesses already using computers. Most will be additions to existing computer rolls, since businesses plan to **replace** only 267,000 of the computers already in use.

The total number of personal computers, by manufacturer, that business plans to buy through 1988...........(approximate numbers)

IBM..............	700,000+
Apple.........	240,000
Compaq......	60,000
AT & T.......	55,000
Tandy.........	55,000

The number of personal computers, by manufacturer, that businesses plan to replace through 1988...........

IBM	58,000
Tandy	38,000
Apple	35,000
AT & T	20,000
Commodore	11,000
Kaypro	9,000
Hewlett-Packard	7,000
Compaq	6,000

The major manufacturers slated for the greatest increases and decreases in market share (determined by comparing the manufacturer's share of planned computer purchases with the share of computers businesses plan to replace)..........IBM (+25%), Apple (+4-5%), Compaq (+2.5%), versus losers.........Tandy (-12%), AT & T (-5%), and Commodore (-3%).

In August 1987, Personal Computing tracked computer buying patterns in Fortune 1000 corporations.

These were the factors influencing buying..........(in percentages of companies)

Factor	1986	1987
MS-DOS compatibility	39%	36%
Other (reliability, IBM-only purchase policies, support, ease of use)	5	35
Price	3	10
Connectability	18	9
Application software	6	4
Service	2	4
Supplier viability	27	2

Buying channels through which Fortune 100 firms buy PCs (in percentages)..........

Channel	1986	1987
Multi-brand retail stores	62%	49%
Mfrs. sales reps	24	22
Direct from manufacturer	30	20
Small-business dealerships	17	10
Mfr.-owned outlets	14	6
Other	2	6
Manufacturer bids	10	3
Value-added integrators	14	1

Classes of computer.........percentage of different types of computers within the Fortune 1000.........

Computer	Current	Year-End 1987	Year-End 1988
Single-user desktop	77 %	75 %	73 %
Multiuser desktop	16	17	19
Laptop	3	4	4
Portable	4	4	4

Computers at home........According to Link Resources, 4 million households in the U.S. use nearly 5 million computers either for office work or in running a home-based business

The length of time employees working in a home office have **owned** their computer.......

76 %	Last six months
15	6 months - one year
9	More than one year

Reasons for using a computer............(source: Dataquest)

	Business At Home	Coporate Homework
Ability to do work	80 %	35 %
Word processing	57	50
Personal finance	55	35
Games	35	48
Learn computers	35	56
Education	30	40

Where computers are bought..........

	Home Business	Others
Computer Store	27 %	35 %
Other	25	40
Department Store	24	17
Purchased Used	12	7
From Manufacturer	12	1

The percentage of computers used, from different manufacturers, in home offices..........(source: Dataquest)

	% of Home Bus. Users	% of Non-Home Bus. Users
IBM	20	16
Apple	14	15
Tandy	5	12
Commodore	14	27

Who picks up the tab ? ....Who buys the home-office computer by business employees ?........

Employee	73 %
Employer	16
Other business*	7
Other household member	4

* "Other Business" refers to a computer buyer who is not the emplyee's primary employer (i.e. A business may buy a computer for a freelance accountant)

OVERVIEW AND RECENT PERFORMANCE OF THE COMPUTER MARKET, BY SEGMENT

The U.S. Department of Commerce publishes an annual "U.S. Industrial Outlook", which examines the recent performance, current outlook, and short-term forecasts for over 350 different industries. Electronics magazine also publishes an annual "U.S. Market Report" each January. The following information was extracted from these two sources, and represents a good overview of the computer industry--which is essentially divided into these segments..........supercomputers, mainframes, medium-scale computers (microcomputers), and microsystems (PCs).

SUMMARY

"Although the industry is facing some short-term problems which should be alleviated when demand picks up, some trends are likely to have longer term repercussions on the structure of the industry. The growing strength of foreign competition, and the standardization of many products, followed by price competition, have contributed to the failure of some U.S. producers and the consolidation of the industry. An important percentage of U.S. production has moved to offshore sites as U.S. manufacturers have sought to remain price competitive."

During 1986, the computer industry faced a sluggish domestic market but relatively strong overseas demand. As in 1985, however, many firms served these foreign markets from overseas production sites that had been put into place in the era of a stronger dollar. U.S. producers were confronted with a heavy influx of foreign imports of price-sensitive low-end equipment from South Korea, Singapore and Taiwan. Product standardization allowed these nations to become serious competitors to U.S. suppliers in the low end of the microcomputer market.

Japanese manufacturers produce a full range of computer products, but the bulk of their computer shipments to the U.S. market in 1986 were **small-scale peripherals** and systems, where the Japanese have the advantage of low-cost, high-volume production. The peripherals and parts sector bore the brunt of the downturn, with estimated declines in shipments of 11% and 6%, respectively, in 1986. Strong competition in dot matrix printers and flexible disk drives was the main cause.

Another key factor contributing to the overall slump was the drop in capital spending by a broad range of computer users. During 1986, real planned spending for new plant and equipment was down 2.5% from the previous year. The computer industry's largest customer--the manufacturing sector--experienced an even higher decline of 6% in durable goods spending. User scrutiny of proposed computer purchases increased, with particular attention to price and usability.

SUPERCOMPUTERS

Demand for supercomputers remained at high levels in 1986, despite continued sluggishness in other U.S. computer market segments. Domestic manufacturers delivered 45 units by year's end, increasing the value of shipments 41% over 1985, to an estimated $520 million. The 1986 **world** supercomputer market was valued at $730 million. U.S. firms supplied roughly 70% of the 65 units shipped worldwide. Japanese producers held the remaining 30%, largely through deliveries to customers in their own market.

University procurement and use of supercomputers has been substantially expanded by the National Science Foundation's efforts to establish supercomputer research centers at Cornell, the University of Illinois, Princeton, the University of California at San Diego, and the Carnegie-Mellon/University of Pittsburgh Consortium.

The U.S. government has also substantially increased support of advanced computer research. The Department of Defense has backed most of this research activity through its Defense Advanced Research Projects Agency (DARPA).

The Europeans have reportedly launched 16 supercomputer R & D projects within larger national high-technology research programs. ESPRIT, a European Community research effort, Marisis in France, Suprenum in West Germany, Flagship in Britain's Alvey program, and Supernode, a joint Anglo-French effort at the Univeristy of Southampton in England have emerged as the key projects.

Electronics' January 1988 "U.S. Market Report" estimates the value of the **supercomputer** market as follows, from 1986-88.........

	1986	1987 ($ Milions)	1988
Supercomputers (over $1 mill.)	$553	$705	$902
% Increase		27.5	27.9
Minisupercomputers ($100k-1 mill.)	209	308	475
% Increase		47.4	54.2
Superminicomp. ($100-400,000)	8,452	9,578	10,632
% Increase		13.3	11.0

MAINFRAMES

Mainframes are high-performance systems used for large-volume, general-purpose applications. According to estimates from Dataquest Inc., the mainframe share of all U.S. computer sales has fallen from 36% five years ago to only 19% by 1986. The slow growth of mainframe sales is caused by near-term market saturation, reduced capital spending, and increased competition at the low end from less costly minicomputers.

Approximately 20 companies throughout the world produce mainframes. The top 10 companies--six American, three Japanese, and one European--account for about 94% of mainframe sales.

Following are Electronics 1988 market estimates for the size of the **mainframe** computer market...........

	1986	1987	1988
		($ Millions)	
Mainframes ($400,000-5 million)	$15,863	$16,815	$17,824
% Increase		6.0	6.0

MINICOMPUTERS

These are situated between microcomputers and mainframes, in terms of size and performance, and include the technically older 8- and 16-bit minicomputers sold by some 40 U.S. vendors, with a large but aging installed base.

In 1986, domestic shipments increased to about 252,000 units, up 5% over 1985 (according to the Commerce Dept.). Much of this growth was in low-end machines, reflecting the move toward smaller equipment. Although marketing and distribution strategies are becoming more critical to minicomputer companies, this sector is still largely driven by technology. Computer designers are striving to increase the speed, power, and functionality of their machines while reducing the size and cost.

Electronics' 1988 estimates for **minicomputers** follow below.........

	1986	1987	1988
		($ Millions)	
Minicomputers ($20,000-100,000)	$2,282	$2,396	$2,468
% Increase		5.0	3.0

MICROSYSTEMS & PERSONAL COMPUTERS

In 1986, U.S.-based producers of microcomputers experienced a second consecutive year of virtually no growth in shipments. The value of shipments remained level with 1985, at about $6 billion. Contributing factors included the slowdown in domestic purchases of microcomputers, and the rapid growth of imports from foreign competitors, and the shift of U.S. producers to offshore manufacturing sites.

In contrast to U.S.-based production, however, the 1986 U.S. market for microcomputers grew 9% in retail sales, to $14.6 billion, after a slight increase of 3% in 1985, according to International Data Corporation. Unit purchases were up 17%, to 6.6 million units, after a 14% decline during 1984.

Microsystems used in business/professional applications accounted for 64% of the value of U.S. microcomputer sales and about 50% of the units purchased. Growth in sales for this use was relatively low, 6%. By contrast, the value of shipments for home, scientific, or educational use grew 13%, 17%, and 20%, respectively. Units purchased by these three groups grew by 13%, from 3. 0 million in 1985 to 3.4 million by 1986.

With an increasing number of microcomputers able to perform roughly identical functions, buyers look more closely at price, the ratio of price to performance, features, and availability of compatible software. This development is indicative of a product that has become increasingly commodity-like and subject to market forces other than technology.

In addition, the nature of buyers has changed. Sellers are finding the days of the easy sale are gone; purchasers are now more apt to comparison shop. This is particularly true for business and professional applications. Businesses are evaluating previous purchases and delaying new ones in anticipation of evolutionary systems and technologies, and further price cuts.

Several other trends have emerged as well. During 1986, distribution channels began to shift noticeably. Manufacturers shifted distribution away from retail stores and toward direct sales. At the same time, sales through "value-added resellers" (VARs) and mail order channels became more popular. Sales through mass marketers such as discount stores dropped significantly as the predicted boom in home computers failed to happen. The number of computer retail stores dropped to about 4,100 in 1986, from about 4,500 in 1985.

Following are Electronics' 1988 estimates for **microcomputer and PC** sales..........

See table, next page..................

	1986	1987 ($ Millions)	1988
Total Microcomputers ($5-20,000)	$5,598	$6,789	$7,882
% Increase		21.3	16.1
Multiuser	4,000	4,472	5,009
% Increase		11.8	12.0
Technical Workstations	1,598	2,317	2,873
% Increase		45.0	24.0
Personal Computers	11,655	14,569	16,944
% Increase		25.0	16.3

Overall, Electronics estimates that the *total* Data Processing Equipment Market (all segments combined) will have grown 14.7% to $51.16 billion during 1987. An 11.7% gain, to $57.127 billion, is forecast for 1988.

For long-term prospects, according to the Commerce Dept., international markets will continue to grow faster than the U.S. market, forcing U.S. suppliers either to increase their focus on exporting or to form strategic international alliances. Mainframes should show moderate growth in value of shipments, averaging 6% annually through 1991. Minicomputer firms are likely to face greater competition from the major European and Japanese firms in the future. Domestic shipments of microsystems are expected to increase at a yearly pace of 5% through 1991.

COMPUTER DISTRIBUTION & RETAIL CHANNELS

The nationwide Yellow Pages list 29,600+ "computer dealers" nationwide. This includes franchises represented by dealers. Of this tally, California had the highest concentration with 3,618, followed by New York state with 2,190 dealers, Texas with 2,317, Florida with 1,625, Ohio with 1,265, and Pennsylvania with 1,197.

The number of **true** computer retailers, excluding franchises, is probably closer to 4,500, and their ranks have been thinned by the industry slump a few years ago. Business Week (June 8, 1987) reports that: "Conditions have improved for retailers since 1985, when slowing sales left them with bulging inventories. But the nation's remaining 4,500 computer dealers still face price wars and razor-thin margins as they battle for market share. During 1986, about 7% of U.S. computer stores dropped out of the business.......".

In 1987, **MBI** Inc. closed 13 of its 33 outlets, and **Sears, Roebuck & Co.** shut 41 of its 100 computer stores. **Entre Computer Centers** in Vienna, VA closed 21 of its 265 stores during 1986. Following are the six major computer retailers, and their sales and after-tax margins (as derived from company reports)...........

	SALES ($ Millions)		AFTER-TAX MARGINS*	
	1987	1986	1987	1986
COMPUTER FACTORY	$41	$22	3.2%	1.8%
INACOMP	51	44	2.0	1.6
BUSINESSLAND	146	101	1.5	0.8
MICROAGE**	84	78	1.5	(2.3)
ENTRE	70	69	(7.4)	2.4
MBI	31	32	(26.0)	2.6

* Most recent quarter vs. comparable year-earlier period.
** For 6 months ended Mar. 31.

The business is dividing in two: dealers with sufficient technical and marketing skills to be chosen by manufacturers to handle the most advanced new products, and everyone else. Apple Computer and IBM, whose products account for 51% of computer-store sales, are both requalifying dealers to make sure that only the best carry products such as the Macintosh II and the most powerful models of the new IBM Personal System/2 line. IBM has 2,00 dealers, and Apple has 2,000. Microage is a 176-unit chain, based in Sausalito, CA.

Dealers who don't make the cut will have to compete in the high-volume discount business--almost a guarantee of slim margins. Industry insiders say that there is a definite move "away from the middle". The dealers that are left are the strong ones.

Retailers also say that IBM is sending mixed signals. On one hand it wants dealers to put more effort and expense into selling IBM products. But it also wants them to buy ever-larger volumes of IBM machines--a tactic that the retailers balme for severe price erosion in the past.

Electronic News reported in December 1987 that total volume for industrial electronics distributors rose a healthy 16% in 1987, falling just short of $7 billion. The $6.97 billion represents a record high, surpassing 1984's $6.8 billion tally. The top 25 distribution companies kept pace, rising from $5.12 billion to $5.8 billion. Computer products accounted for roughly 33% of the 1987 total, underscoring an increased penetration of the industrial and commercial systems markets by upper-tier houses.

Industrials also benefitted from firming components prices and improved margins. 1988 volume may be adversely affected by post- stock market crash and election year uncertainties. Nonetheless, total volume is expected to increase at least 10%, to $7.66 billion. The top 25 companies should post similar gains, with volume of approximately $6.4 billion.

Following is Electronic News' analysis of distribution volume, broken down by three segments, for 1980-88........

INDUSTRIAL DISTRIBUTION VOLUME

	TOTAL	TOP 25 FIRMS	SYSTEMS, PERIPHERALS & BOARDS
		($ Billions)	
1980	$3.85	$2.80	$0.250
1981	3.95	2.97	0.350
1982	4.20	3.00	0.600
1983	5.20	4.10	1.0

Table continued..........

1984	6.80	5.65	1.2
1985	5.80	4.70	1.4
1986	6.00	5.12	1.65
1987	6.97	5.80	1.86
1988 Est.	7.66	6.40	2.13

HOW THE TOP 25 COMPANIES RANK

Riding the crest of a business upturn, Avnet remains solidly entrenched in the number one spot at $1.2 billion, more than double second-place Arrow, which posted sales of $570 million. That lead evaporated at the beginning of 1988, when Arrow completed its acquisition of Kierulff (with an additional $380 million in sales). Lex was third with $550 million in revenues, while Hall-Mark came in at $480 for fourth place. Marshall overtook Pioneer to claim the fifth spot, at $352 million. Pinoneer was sixth at $320 million. The Canadian house Wyle was seventh at $265 million. Future was next at $260 million, and It has been mounting an aggressive expansion campaign in the U.S.

A complete list of the top 25, with their sales, geographic location, and private/public ownership information appears within this section.

THE COMPUTER PRINTER & PLOTTER MARKET

NUMBER OF COMPUTER DEALERS, BY STATE - 1987
(Includes Franchises Represented By Dealers)

STATE		STATE	
TOTAL U.S.	**29, 618**		
ALABAMA	388	NEBRASKA	218
ALASKA	176	NEVADA	159
ARIZONA	505	NEW HAMPSHIRE	166
ARKANSAS	243	NEW JERSEY	761
CALIFORNIA	**3618**	NEW MEXICO	220
COLORADO	617	**NEW YORK**	**2190**
CONNECTICUT	484	NO. CAROLINA	669
DELAWARE	102	NORTH DAKOTA	106
D.C.	75	**OHIO**	**1265**
FLORIDA	**1625**	OKLAHOMA	410
GEORGIA	722	OREGON	470
HAWAII	159	**PENNSYLVANIA**	**1197**
IDAHO	168	RHODE ISLAND	107
ILLINOIS	**1145**	SO. CAROLINA	296
INDIANA	515	SOUTH DAKOTA	81
IOWA	298	TENNESSEE	506
KANSAS	346	**TEXAS**	**2317**
KENTUCKY	296	UTAH	271
LOUISIANA	490	VERMONT	77
MAINE	128	VIRGINIA	753
MARYLAND	626	WASHINGTON	696
MASSACHUSETTS	757	W. VIRGINIA	147
MICHIGAN	930	WISCONSIN	517
MINNESOTA	615	WYOMING	76
MISSISSIPPI	195		
MISSOURI	593		
MONTANA	127		

SOURCE: American Business Lists, Compiled From Yellow Pages

THE COMPUTER PRINTER & PLOTTER MARKET

COMPOSITE FINANCIAL STATEMENTS-COMPUTER & SOFTWARE RETAILERS
ALL ASSET SIZES-GROUP AS A WHOLE
HISTORICAL DATA - 9 MONTHS (JUNE 30-NEXT MARCH 31)

	1984	1985	1986	1987
NO. OF STATEMENTS	57	193	209	247
BALANCE SHEET				
ASSETS		% of Total		
Cash & equivalents	6.7	7.5	7.8	8.1
Net trade receivables	27.2	27.6	28.6	31.2
Inventory	41.0	35.6	35.5	34.3
All other current	3.1	2.2	2.0	2.0
Total current	77.9	72.9	74.0	75.6
Net fixed assets	15.5	18.2	17.2	16.7
Net intangibles	2.5	2.7	2.1	2.8
All other non-current	4.1	6.2	6.7	4.9
LIABILITIES				
Short term notes payable	17.9	18.5	19.1	19.1
Curr. Mat.-LT debt	3.5	3.8	4.4	5.0
Trade payables	25.6	21.9	21.0	20.4
Income taxes payable	---	1.5	1.5	1.6
All other current	14.5	12.4	11.9	9.7
Total current	61.5	58.0	57.9	55.8
Long term debt	10.1	15.1	14.6	14.4
Deferred taxes	---	0.4	0.5	0.7
All other non-current	2.9	2.2	2.6	3.6
Net worth	25.5	24.3	24.4	25.4
INCOME STATEMENT				
Net sales	100.0	100.0	100.0	100.0
Gross Profit	34.2	36.0	35.9	36.3
Operating Expenses	29.2	31.4	31.9	32.4
Operating Profit	5.1	4.6	4.1	3.8
All Other Expenses (net)	1.1	1.1	1.6	0.9
Profit Before Taxes	4.0	3.5	2.5	2.9
RATIOS				
Current	1.2	1.2	1.3	1.4
Debt/worth	3.1	3.7	3.8	3.2
% Prof.bef.tax/tot.assets	10.6	9.1	7.0	7.3
Sales/total assets	3.1	2.9	3.0	3.2

SOURCE: Robert Morris Associates, Annual Financial Statements

THE COMPUTER PRINTER & PLOTTER MARKET

THE TOP 25 ELECTRONICS DISTRIBUTORS-1987 SALES

Company/Hdqtrs. Location	1987 Sales	Public Co. ?	Privately Held ?
1. AVNET INC./New York	$1.2 bill.	Yes	
2. ARROW/KIERULFF/Melville, NY	570 mill.	Yes	
3. LEX ELECTRONICS/Stamford, CT*	550 mill.	Yes	
4. HALL-MARK ELECTRONICS/Dallas, TX#	480 "		Yes
5. MARSHALL INDUSTRIES/El Monte, CA	352 "	Yes	
6. PIONEER-STANDARD ELEC./Cleveland, OH	320 "	Yes	
7. WYLE LABORATORIES/Irvine, CA	265 "	Yes	
8. FUTURE ELECTRONICS/Montreal, Quebec	260 "		Yes
9. PREMIER INDUSTRIAL CORP./Cleveland, OH	220 "	Yes	
10. BELL INDUSTRIES/Los Angeles, CA	200 "	Yes	
11. ANTHEM ELECTRONICS/ San Jose, CA	195 "	Yes	
12. ZEUS COMPONENTS/Port Chester, NY	89 "	Yes	
13. TTI INC./Ft. Worth, TX	79 "		Yes
14. MILGRAY ELECTRONICS/Farmingdale, NY	75	Yes	
15. SEMISPECIALISTS OF AMERICA/Melville, NY	70		Yes
16. WESTERN MICROTECHNOLOGY/Saratoga, CA	64	Yes	
17. POWELL ELECTRONICS/Philadelphia, PA	58		Yes
18. DEANCO INC./Ithaca, NY	56		Yes
19. JACO ELECTRONICS/Hauppauge, NY	47	Yes	
20. STERLING ELECTRONICS/Houston, TX	46	Yes	
21. CYPRESS ELECTRONICS/Santa Clara, CA	45	Yes	
22. INTEGRATED ELECTRONICS CORP./Denver, CO+	44		Yes
23. SHELLEY-RAGON/St. Paul, MN	40		Yes
24. HAMMOND ELECTRONICS/Orlando, FL	36		Yes
25. CHELSEA INDUSTRIES/Boston, MA	34	Yes	

* Div. of Lex Services plc, London, Includes Schweber Electronics Corp

# Wholly-owned subsidy. of Tyler Corp.

+ Subsidiary of Walker Components

SOURCE: Electronic News

ECONOMIC STRUCTURE AND OPERATING STATISTICS OF THE INDUSTRY -ELECTRONIC COMPUTING EQUIPMENT PLANTS

HISTORICAL GROWTH & FORECASTS FOR PLANT SHIPMENTS

Marketdata estimates that total receipts by all U.S. computer manufacturing facilities nationwide rose 8.7 % to $60.13 billion during 1986. For 1987, we estimate that growth improved substantially, with revenues rising 10.9 % to $66.68 billion. This estimate is based on historical data reported by the U.S. Census Bureau (Annual Survey of Manufactures), major industry trade journal forecasts, and Marketdata's recent discussions with printer/plotter manufacturers, retailers, and other industry analysts. **For 1988, Marketdata expects sales volume to rise 9.6 % to $73.08 billion.**

For the long term through 1995, we forecast receipts to grow at a 12 % average annual rate (incl. inflation). This takes into account our projections of economic recessions in 1989 and 1994, in line with general business cycles. It is likely that computer sales would stay virtually the same or decline 2-5% in such years.

The Census Bureau reported total receipts of $55.31 billion in 1985, a 3.3% increase from the prior year. Total computer equipment factory shipments doubled between 1980 and 1985, increasing at a 21.6% rate. For the longer term, from 1975 to 1985, the growth rate was even higher--a 54.6% average yearly gain from only $8.55 billion in 1985.

INDUSTRY STRUCTURE

The computer manufacturing industry is comprised of **1,516 companies that operated 1,730 production plants nationwide in 1982.** These plants employed over 355,000 workers in 1985, and generated shipments of equipment worth $55.3 billion. Manufacturers invested $3.14 billion in new capital in 1985, a record high. A majority, nearly 52% of all plants, are small, employing less than 20 workers in 1982. However, the larger plants captured the bulk of industry sales volume. Plants with employments of 500 or more workers captured fully 82% of total factory sales in 1982. In fact just those facilities employing 2,500 or more workers accounted for 57% of shipments.

Computer equipment manufacturing plants had a "**Specialization Ratio**" of 95% in 1982, meaning that their "primary" products (computers and related peripsheral equipment) accounted for 95% of these plants' total sales. The ratio has not changed significantly since 1967 (96%). The **"Coverage Ratio"** stood at 94% as of 1982, and is up slightly from the 91% figure recorded in 1977 and 1972. The coverage ratio measures the percentage of computer equipment sales accounted for by **this** industry's plants (vs. computer equipment manufactured by **other** industries). Therefore, this rise to 94% means that slightly more computer equipment is being produced and sold by this industry.

OPERATING COSTS & INVENTORY TRENDS

Computer plants nationwide recorded combined payroll and materials costs of 75% of each sales dollar in 1985. Operating costs have been rising steadily since 1981, when they were at 68%. The mid-late 1970s was a period of low historical operating costs for producers.

A rising "inventory/shipments ratio usually is a sign of trouble for manufacturers. It could signal that inventories are getting out of balance, relative to the sales volume of the industry. Unintentional inventory build-ups catch manufacturers by surprise and are costly in high interest rate environments. A declining inventory/shipments ratio is an indicator that producers are managing stock better, forecasting sales volumes more accurately, and running a "leaner" operation in general.

This ratio rises during recession years. Such was the case for computer producers during 1970, 1974, and 1980. The ratio for this industry was the worst (highest) in 1970--3.68. By 1985, stocks were in firm control, as the inventory/shipments ratio was cut to 2.24, the lowest level in 19 years dating back to 1967. As of 1985, 53.4% of the value of manufacturers' inventories was in the form of "work-in-process". 27.8% was in "materials, supplies and fuels", and the remaining 18.8% was "finished products". A slightly higher share of inventory value has been in finished products in recent years.

GEOGRAPHIC TRENDS - NUMBER OF PLANTS, BY REGION & STATE

The Department of Commerce's publication: County Business Patterns (individual state books), provides data for 1985, a little more current than the Census Bureau. The Commerce Dept. reports that there were **2,016 computer equipment plants in the U.S**. in 1985. Industry employment was listed at 384,138 workers (implying an 8% higher number than that reported by the Census Bureau).

The typical computer plant employed 190 people in 1985, according to the Commerce Dept. Many states' centers did not report **exact** employment figures. In these cases, a **range** (i.e. 250-500 employees) is used. Several states' plants differ substantially from this national average. For example, Minnesota's plants employed an average of 518 workers, while those facilities located in Ohio employed only 20.

By region, the **Pacific** area (Washington, Oregon, California) by far was the site of the most computer plants--813 in 1985. California alone had 737 plants and accounted for nearly one-third of the industry's employment. No doubt, "Silicon Valley" is the primary location of many of these plants. **New England** states followed at 245, and **Mid-Atlantic** states were next at 214.

MARKET SHARE

The Census Bureau did calculate some share of market information for computer manufacturers, for 1972, 1977 and 1982. The top 50 firms were tracked. The industry has become more competitive, as more companies appear on the scene and fight for sales. Evidence of this is the declining industry "concentration ratio" calculated by the Census Bureau. **As of 1982, the 4 largest firms captured 37 % of total receipts, compared to 52% ten years earlier. The top 8 firms captured 54% (vs. 64 % in 1972). The top 20 companies captured 71 % (vs. 83 % in 1972), and the top 50 firms took 87 % of industry sales (vs. 94 % in 1972).** These shares are cumulative.

STATISTICS BY EMPLOYMENT SIZE OF PLANTS

In 1982, 476 (27.5 %) of the 1,730 total computer plants employed less than five people. The breakdown was fairly evenly spread out amongst the next three classes: 218 plants employing 5-9 people, 202 employing 10-19, and 259 employing 20-49 workers. Only 20 plants employed more than 2,500 people, and 55 employed more than 1,000. The bulk of employment is accounted for by the largest plants, and the same is true for share of sales and new capital investment.

THE LABOR SITUATION

Industry employment was at its second highest level ever during 1985, 355,500 total workers. Peak labor rolls were recorded one year earlier, at 373,700 workers. Employment has increased 16.7% from 1980-85. Production workers, for the first time in 18 years, represented less than 40% of the industry's workforce in 1985--38%. This can be contrasted to 49% as recently as 1974. These production workers' average hourly wages rose 6.6% to $10.41 in 1985. Wages have increased at a rapid 9.8% rate from 1980-85, and doubled over the ten year period 1975-85.

On the **output** side of the equation, "value added" per production worker man-hour rose 7% to $89.38 during 1985, and has risen 12.6% annually from 1980-85 (faster than wage increases by 2.8%). This is a healthy sign. The value added/wage ratio, one measure of worker productivity, has risen 10 times in the 18 year period of 1967-85, a spotty record. The best productivity performance for the industry was achieved during 1976, with a value added/wage ratio of 8.64. This figure was nearly reached in 1985--8.59.

LEGAL FORM OF ORGANIZATION

About 95% of all computer **plants** in 1982 were owned by **corporations**. 2.6% were **individual proprietorships**, and 1.8% were classified as **partnerships**. Corporate-owned manufacturing plants captured over 99% of total receipts, and represented 99.8% of total industry employment. 1,256 of the 1,520 companies and 1,256 of the 1,739 plants were classified as "single-unit" operations in 1982. Corporate-owned plants dwarfed non-corporate types in average shipments per plant ($22.4 million vs. $700,000), but, interestingly, non-corporate plants incurred lower operating costs (payroll & materials) relative to sales (56-60% vs. 69.5%).

FINANCIAL PERFORMANCE OF COMPUTER PLANTS

Robert Morris Associates tracks the financial performance of a wide variety of industries each year, via their "Financial Statement Studies". The computer industry is covered, and a five-year analysis appears at the end of this section. Composite group balance sheets, income statements, and key ratios are provided.

THE COMPUTER PRINTER & PLOTTER MARKET

GENERAL STATISTICS FOR ELECTRONIC COMPUTING EQUIPMENT PLANTS

	NUMBER OF COMPANIES	NUMBER OF PLANTS	INDUSTRY EMPLOYMENT (Thous.)	VALUE OF SHIPMENTS ($ Millions)	END-OF-YEAR INVENTORIES ($ Millions)
1967	134	178	98.9	$3,770.9	$985.6
1968	NA	NA	108.7	4,163.4	1,080.4
1969	NA	NA	139.9	5,112.2	1,469.2
1970	NA	NA	145.7	5,232.4	1,603.8
1971	NA	NA	153.2	5,700.1	1,666.8
1972	518	601	144.8	6,471.2	1,574.1
1973	NA	NA	155.3	7,422.7	2,004.7
1974	NA	NA	176.7	9,121.5	2,477.9
1975	NA	NA	162.5	8,559.5	2,264.4
1976	NA	NA	165.7	10,387.6	2,293.8
1977	802	931	192.6	12,921.8	3,007.7
1978	NA	NA	232.1	16,557.8	3,988.9
1979	NA	NA	273.9	21,466.3	5,523.9
1980	NA	NA	304.6	26,593.7	6,878.9
1981	NA	NA	320.7	32,031.8	7,863.4
1982	1516	1730	336.1	36,703.9	8,434.2
1983	NA	NA	354.4	41,977.0	9,085.4
1984	NA	NA	373.7	53,524.4	11,718.9
1985	NA	NA	355.5	55,314.7	10,320.1

NA - DATA NOT AVAILABLE IN BETWEEN CENSUS YEARS

SOURCE: Census & Annual Surveys of Manufactures

THE COMPUTER PRINTER & PLOTTER MARKET

SELECTED OPERATING RATIOS FOR ELECTRONIC COMPUTING EQUIPMENT PLANTS

	COST OF PAYROLL & MTLS. AS % VALUE OF SHIPMENTS	PRODUCTION WORKERS AS % TOTAL EMPLOYMENT	AVG. HOURLY EARNINGS OF PRODUCTION WORKERS	VALUE ADDED PER PRODUCT. WORKER HOUR
	(Percent)	(Percent)	(Dollars)	(Dollars)
1967	71	51	$3.02	$18.49
1968	71	51	3.23	19.11
1969	77	50	3.49	18.94
1970	76	46	3.75	21.18
1971	72	47	3.80	22.19
1972	72	45	4.19	26.78
1973	72	48	4.36	27.99
1974	70	49	4.60	30.09
1975	70	45	5.01	32.15
1976	66	43	4.91	42.42
1977	67	44	5.68	44.22
1978	68	44	6.26	47.59
1979	69	45	6.34	51.13
1980	70	44	6.98	54.77
1981	68	42	8.05	67.46
1982	69	42	8.60	71.89
1983	73	42	9.04	70.01
1984	75	42	9.77	83.55
1985	75	38	10.41	89.38

SOURCE: Census & Annual Surveys of Manufactures

THE COMPUTER PRINTER & PLOTTER MARKET

NUMBER OF ELECTRONIC COMPUTING EQUIPMENT PLANTS BY STATE & REGION (1985)

	NO. OF PLANTS	NO. OF EMPLOYEES	AVG. NO. OF EMPLOYEES PER PLANT
TOTAL U.S.	**2,016**	**384,138**	**190.5**
NEW ENGLAND	**245**	**64,801-68,048**	
MAINE	4	1000-2499	250-625
NEW HAMPSHIRE	37	13,594	367
VERMONT	4	1000-2499	250-625
RHODE ISLAND	6	250-499	42-83
CONNECTICUT	36	3641	101
MASSACHUSETTS	158	45,316	287
MID-ATLANTIC	**214**	**34,471-39,470**	
NEW YORK	110	25,693	234
NEW JERSEY	52	3778	73
PENNSYLVANIA	52	5000-9999	96-192
EAST NO. CENTRAL	**139**	**5161-7159**	
OHIO	34	667	20
INDIANA	14	314	22
ILLINOIS	32	500-999	16-31
MICHIGAN	43	2680	62
WISCONSIN	16	1000-2499	63-156
WEST NO. CENTRAL	**123**	**46,744-50,241**	
MINNESOTA	81	41,998	518
IOWA	3	500-999	167-333
MISSOURI	21	750	36
SO. DAKOTA	2	1000-2499	500-1250
NEBRASKA	6	1000-2499	167-417
KANSAS	9	1496	166
SOUTH ATLANTIC	**210**	**32,737-92,481**	
DELAWARE	3	250-499	83-166
MARYLAND	36	1982	55

TABLE CONTINUED..................

NUMBER OF ELECTRONIC COMPUTING EQUIPMENT PLANTS BY STATE & REGION

(1985)

Table Continued........

	NO. OF PLANTS	NO. OF EMPLOYEES	AVG. NO. OF EMPLOYEES PLANT
SOUTH ATLANTIC (CONT.)			
VIRGINIA	31	4005	129
NO. CAROLINA	28	10,000-24,999	357-893
SO.CAROLINA	6	500-999	83-167
GEORGIA	34	1000-2499	29-44
FLORIDA	57	10,000-24,999	175-439
PUERTO RICO	15	5000-9999	333-667
EAST SO. CENTRAL	**19**	**2500-5997**	
KENTUCKY	3	500-999	167-333
TENNESSEE	7	1000-2499	143-278
ALABAMA	9	1000-2499	111-278
WEST SO. CENTRAL	**126**	**26,820-29,319**	
OKLAHOMA	16	2500-4999	156-312
TEXAS	110	24,320	221
MOUNTAIN	**128**	**32,801-56,296**	
IDAHO	5	2500-4999	500-1000
COLORADO	47	10,000-24,999	213-532
NEW MEXICO	4	500-999	125-250
ARIZONA	36	14,301	397
UTAH	31	5000-9999	161-323
NEVADA	5	500-999	100-200
PACIFIC	**813**	**113,500-118,499**	
WASHINGTON	40	3296	82
OREGON	36	5000-9999	139-278
CALIFORNIA	737	105,204	143

NOTE: All states' data not available. No data for: MS, WV, AR, LA, MT, WY, HI, AK.

SOURCE: U.S. DEPT. OF COMMERCE, COUNTY BUSINESS PATTERNS,
MARKETDATA CALCULATIONS

THE COMPUTER PRINTER & PLOTTER MARKET

ELECTRONIC COMPUTING EQUIPMENT PLANTS

VALUE OF MANUFACTURER SALES, BY STATE
RANKED BY 1982 SHIPMENTS *

STATE	VALUE OF SHIPMENTS ($ Millions)	% OF U.S. TOTAL
TOTAL U.S.	$ 36,703.9	100.0
CALIFORNIA	9,968.4	27.2
MASSACHUSETTS	4,189.4	11.4
MINNESOTA	3,408.8	9.3
NEW YORK	3,368.7	9.2
TEXAS	2,147.1	5.8
FLORIDA	1,855.0	5.1
NEW HAMPSHIRE	1,131.1	3.1
UTAH	505.2	1.4
PENNSYLVANIA	452.6	1.2
NEW JERSEY	439.0	1.2
MICHIGAN	268.1	0.7
WASHINGTON	220.4	0.6
VIRGINIA	198.4	0.5
GEORGIA	94.9	0.3
MISSOURI	59.3	0.2
OHIO	43.8	0.1
INDIANA	14.9	---

*** NOTE: DATA NOT AVAILABLE FOR ALL STATES, SOME DATA
AVOID DISCLOURE OF OPERATIONS**

SOURCE: **1982 Census of Manufactures, Marketdata Ranking &
Calculations**

THE COMPUTER PRINTER & PLOTTER MARKET

SHARE OF MARKET -INDUSTRY CONCENTRATION LEVELS

FOR MANUFACTURERS OF COMPUTER PERIPHERAL* EQUIPMENT (1982)

----Percent Of Industry Shipments By ----

	4 LARGEST COMPANIES	8 LARGEST COMPANIES	20 LARGEST COMPANIES	50 LARGEST COMPANIES
1972	52	64	83	94
1977	44	55	73	89
1982	37	54	71	87

* Peripheral equipment (SIC code 35732) includes printers & plotters

SOURCE: 1982 Census of Manufactures

ELECTRONIC COMPUTING EQUIPMENT MANUFACTURING PLANTS STATISTICS, BY PLANT EMPLOYMENT SIZE (1982)

PLANTS WITH AN AVERAGE OF:	NO. OF PLANTS	NO. OF EMPLOYEES (Thous.)	VALUE OF SHIPMENTS ($ Mill.)	NEW CAPITAL INVESTMENT ($ Mill.)
1-4 Employees	476	0.8	$74.2	$4.4
5-9 "	218	1.5	124.2	7.3
10-19 "	202	2.8	232.7	14.0
20-49 "	259	8.2	597.1	38.7
50-99 "	164	11.7	907.2	51.8
100-249 "	159	25.1	2,090.2	110.4
250-499 "	111	39.8	4,679.1	196.3
500-999 "	66	46.8	4,961.2	282.4
1000-2499 "	55	80.6	8,428.0	312.3
2500 OR MORE	20	118.8	14,609.9	1,354.7
TOTAL:	**1730**	**336.1**	**36,703.9**	**2,372.3**

* Data withheld to avoid disclosure of individual companies.

SOURCE: 1982 Census of Manufactures

THE COMPUTER PRINTER & PLOTTER MARKET

LABOR PRODUCTIVITY ANALYSIS, SPECIALIZATION & COVERAGE RATIOS OF ELECTRONIC COMPUTING EQUIPMENT MANUFACTURING PLANTS

	Production Worker Wages Per Man-Hour (Dollars)	Value Added Per Prod. Worker Man-Hour (Dollars)	Value Added / Wage Ratio	Specialization Ratio*	Coverage Ratio**
1967	$3.02	$18.49	6.12	**96**	**97**
1968	3.23	19.11	5.92	**NA**	**NA**
1969	3.49	18.94	5.43	**NA**	**NA**
1970	3.75	21.18	5.65	**NA**	**NA**
1971	3.80	22.19	5.84	**NA**	**NA**
1972	4.19	26.78	6.39	**92**	**91**
1973	4.36	27.99	6.42	**NA**	**NA**
1974	4.60	30.09	6.54	**NA**	**NA**
1975	5.01	32.15	6.42	**NA**	**NA**
1976	4.91	42.42	8.64	**NA**	**NA**
1977	5.68	44.22	7.78	**94**	**91**
1978	6.26	47.59	7.60	**NA**	**NA**
1979	6.34	51.13	8.07	**NA**	**NA**
1980	6.98	54.77	7.85	**NA**	**NA**
1981	8.05	67.46	8.38	**NA**	**NA**
1982	8.60	71.89	8.36	**95**	**94**
1983	9.04	70.01	7.74	**NA**	**NA**
1984	9.77	83.55	8.55	**NA**	**NA**
1985	10.41	89.38	8.59	**NA**	**NA**

NA - Data not available these years

* Measures degree to which plants specialize in their primary product.

** Measures % of product sales accounted for by this industry's plants.

SOURCE: Census & Annual Surveys of Manufactures,
Marketdata Calculations

ELECTRONIC COMPUTING EQUIPMENT PLANTS

MANUFACTURING STATISTICS BY TYPE COMPANY OWNERSHIP AND LEGAL FORM OF ORGANIZATION (Continued)

	SHIPMENTS PER PLANT ($ Mill.)	SHIPMENTS PER EMPLOYEE (Dollars)	PAYROLL PER EMPLOYEE (Dollars)
ALL INDUSTRY PLANTS	$21.1	$ 108,810	$ 23,831
TYPE OWNERSHIP			
Multi-unit companies	68.7	113,546	24,228
Single-unit companies	2.84	78,284	21,238
LEGAL FORM OF ORGAN.			
Corporate	22.4	108,877	23,851
Noncorporate	0.7	80,375	15,250
Indiv. proprietorship	0.29	130,000	22,000
Partnerships	0.99	79,500	12,000
Other and unknown	1.63	98,000	26,000

	PAYROLL & MTLS. AS % SHIPMENTS	PRODUCTION WORKER HRLY. WAGES
ALL INDUSTRY PLANTS	69.4	$8.57
TYPE OWNERSHIP		
Multi-unit companies	69.5	8.71
Single-unit companies	68.5	7.68
LEGAL FORM OF ORGAN.		
Corporate	69.5	8.58
Noncorporate	63.3	5.33
Indiv. proprietorship	56.2	6.00
Partnerships	60.1	4.50
Other and unknown	72.9	7.50

SOURCE: 1982 Census of Mfrs., Marketdata Calculations

THE COMPUTER PRINTER & PLOTTER MARKET

ELECTRONIC COMPUTING EQUIPMENT PLANTS

MANUFACTURING STATISTICS BY TYPE COMPANY OWNERSHIP AND LEGAL FORM OF ORGANIZATION

	NO. OF COMPANIES	NO. OF MFG. PLANTS	NO. OF EMPLOYEES (Thou.)	NO. OF PRODUCTION WORKERS (Thous.)
ALL INDUSTRY PLANTS	**1520**	**1739**	**337.9**	**140.9**
TYPE OWNERSHIP				
Multi-unit comapnies	264	483	292.3	120.6
Single-unit companies	1256	1256	45.7	20.3
LEGAL FORM OF ORGAN.				
Corporate	1431	1650	337.1	140.4
Noncorporate	89	89	0.8	0.5
Indiv. proprietorship	45	45	0.1	0.1
Partnerships	32	32	0.4	0.3
Other and unknown	12	12	0.2	0.1

	VALUE OF SHIPMTS. ($ Mill.)	NEW CAPITAL EXPEND. ($ Mill.)
ALL INDUSTRY PLANTS	**$ 36, 767.1**	**$ 2, 381.3**
TYPE OWNERSHIP		
Multi-unit companies	33, 189.5	2, 162.8
Single-unit companies	3, 577.6	218.5
LEGAL FORM OF ORGAN.		
Corporate	36, 702.7	2, 378.6
Noncorporate	64.3	2.6
Indiv. proprietorship	13.0	0.8
Partnerships	31.8	NA
Other and unknown	19.6	NA

SOURCE: 1982 Census of Manufactures **NA - Data not available**

THE COMPUTER PRINTER & PLOTTER MARKET

ELECTRONIC COMPUTING EQUIPMENT MANUFACTURERS
INVENTORY TREND ANALYSIS
INVENTORY/SHIPMENTS RATIO *

	INVENTORY SHIPMENTS RATIO *	VALUE OF YEAR-END INVENTORIES ($ Millions)	AVERAGE MONTHLY SHIPMENTS ($ Millions)
1967	3.14	$985.6	$314.2
1968	3.11	1,080.4	347.0
1969	3.45	1,469.2	426.0
1970	3.68	1,603.8	436.0
1971	3.51	1,666.8	475.0
1972	2.92	1,574.1	539.3
1973	3.24	2,004.7	618.6
1974	3.26	2,477.9	760.1
1975	3.18	2,264.4	713.3
1976	2.65	2,293.8	865.6
1977	2.79	3,007.7	1,076.8
1978	2.89	3,988.9	1,379.8
1979	3.09	5,523.9	1,788.9
1980	3.10	6,878.9	2,216.1
1981	2.95	7,863.4	2,669.3
1982	2.76	8,434.2	3,058.7
1983	2.60	9,085.4	3,498.1
1984	2.63	11,718.8	4,460.4
1985	2.24	10,320.1	4,609.6

* Derived by dividing year-end inventory value by avg. monthly shipments.

SOURCE: Calculated by Marketdata, From 1982 Census of Mfrs.
And Annual Survey of Mfrs. Data

COMPOSITION OF MANUFACTURER INVENTORIES BY STAGE OF FABRICATION U.S. ELECTRONIC COMPUTING EQUIPMENT PLANTS

		------- PERCENT OF TOTAL FOR -------		
	VALUE OF TOTAL END-OF-YEAR INVENTORIES ($ Millions)	FINISHED PRODUCTS	WORK-IN-PROCESS	MATERIALS, FUELS & SUPPLIES
1975	$ 2,264.4	15.8	56.7	27.5
1976	2,293.8	18.3	53.2	28.5
1977	3,007.7	17.9	54.7	27.4
1978	3,988.9	17.5	56.2	26.3
1979	5,523.9	16.3	56.2	27.5
1980	6,878.9	17.3	54.0	28.7
1981	8,032.9	15.9	57.1	27.0
1982	8,434.2	16.7	56.5	26.8
1984	11,718.9	18.6	53.7	27.7
1985	10,320.1	18.8	53.4	27.8

SOURCE: CENSUS & ANNUAL SURVEYS OF MANUFACTURES,
MARKETDATA CALCULATIONS

NEW CAPITAL INVESTMENT TRENDS, BY U.S. ELECTRONIC COMPUTING EQUIPMENT MANUFACTURERS

	NEW CAPITAL EXPENDITURES ($ Millions)	ANNUAL % CHANGE	CAPITAL EXPEND. AS % INDY. SHIPMENTS
1967	$117.1		3.10
1968	122.5	4.6	2.94
1969	269.2	119.8	5.26
1970	296.2	10.0	5.66
1971	294.5	-0.6	5.16
1972	212.8	-27.8	3.28
1973	207.3	-2.6	2.79
1974	296.0	42.8	3.24
1975	292.3	-1.2	3.41
1976	373.1	27.6	3.59
1977	651.4	74.6	5.04
1978	1,101.0	69.0	6.64
1979	1,316.8	19.6	6.13
1980	1,737.9	32.0	6.53
1981	2,124.9	22.3	6.63
1982	2,372.3	11.6	6.46
1983	2,240.5	-5.6	5.33
1984	3,036.6	35.5	5.67
1985	3,139.7	3.4	5.67

SOURCE: CENSUS & ANNUAL SURVEYS OF MANUFACTURES,
MARKETDATA CALCULATIONS

THE COMPUTER PRINTER & PLOTTER MARKET

COMPOSITE FINANCIAL STATEMENTS-COMPUTER MANUFACTURERS
ALL ASSET SIZES-GROUP AS A WHOLE
HISTORICAL DATA - 9 MONTHS (JUNE 30-NEXT MARCH 31)

	1983	1984	1985	1986	1987
NO. OF STATEMENTS	178	188	227	192	169
BALANCE SHEET					
ASSETS	% of Total				
Cash & equivalents	10.3	13.8	10.5	12.7	12.8
Net trade receivables	28.6	28.8	30.2	28.5	31.0
Inventory	28.3	25.8	27.9	26.4	26.5
All other current	2.5	3.1	2.3	3.1	3.1
Total current	69.7	71.5	70.9	70.7	73.4
Net fixed assets	23.2	21.5	21.9	22.0	19.4
Net intangibles	1.4	1.0	1.1	1.3	1.8
All other non-current	5.7	6.0	6.1	6.0	5.4
LIABILITIES					
Short term notes payable	6.7	6.7	9.2	10.6	7.8
Curr. Mat.-LT debt	2.3	3.0	2.3	2.9	3.6
Trade payables	13.4	14.8	14.5	13.3	13.9
Income taxes payable	---	---	1.8	1.8	1.8
All other current	12.5	12.0	11.0	10.5	10.8
Total current	34.8	36.4	38.9	39.1	38.0
Long term debt	12.3	11.2	10.8	10.8	10.6
Deferred taxes	---	---	1.1	0.7	1.1
All other non-current	5.0	2.6	2.1	2.0	3.1
Net worth	47.9	49.9	47.1	47.4	47.2
INCOME STATEMENT					
Net sales	100.0	100.0	100.0	100.0	100.0
Gross Profit	40.3	40.1	40.9	40.9	43.4
Operating Expenses	34.5	34.3	34.1	38.0	38.7
Operating Profit	5.8	5.9	6.8	2.9	4.7
All Other Expenses (net)	0.9	1.2	1.3	1.6	1.8
Profit Before Taxes	4.9	4.6	5.5	1.3	2.8
RATIOS					
Current	2.1	2.0	1.9	2.0	2.1
Debt/worth	1.1	1.0	1.1	1.1	1.0
% Prof.bef.tax/tot.assets	8.6	8.6	9.0	3.9	6.6
Sales/total assets	1.5	1.4	1.5	1.5	1.6

SOURCE: Robert Morris Associates, Annual Financial Statements

PRINTER COMPANY PROFILES

SUMMARY INFORMATION

Location, Estimated Sales Volume, Employment, Geographic Sales/Marketing Concentrations of Major Printer Manufacturers

Citizen America (Santa Monica, CA): subsidiary of Citizen Watch Co., Japan

Data Printer Corp. (Malden, MA): 300 employees, 8 offices nationwide, subsidiary of Printonix

Dataproducts Corp. (Woodland Hills, CA): 4200 employees, $50+ million in sales, sells internationally

Datasouth Computer Corp. (Charlotte, NC): 235 employees, $20-50 million in sales, sells in 50 metropolitan areas nationwide, in Canada, W. Europe, Australia, New Zealand

Epson America (Torrance, CA): has 12 regional sales and marketing branches in the U.S., subsidiary of Seiko Epson Corp.

Fujitsu America (San Jose, CA): subsidiary of Fujitsu Ltd., 806 employees, sells nationwide

Genicom Corp. (Waynesboro, VA): 200 employees, $50+ million in sales, direct sales offices in the U.S., Canada, Europe, Australia

Gulton Industries Inc. - Graphics Instruments Div. (E. Greenwich, RI): 400 employees, $20-50 million in sales, sales concentration in New York, Chicago, Los Angeles, San Francisco, Greenwich, CT

MAI Basic Four (Tustin, CA): 2700 employees, $50+ million in sales, sells nationwide and internationally

Mannesmann Tally (Kent, WA): 1500 employees, sells worldwide

Miltope Corp. (Melville, NY): 650 employees, $50+ million in sales, sells primarily in: NY, FL, CA, WA, Dist. of Columbia, MA, TX--small-medium-sized cities

NEC Information Systems (Boxborough, MA): 1205 employees, $50+ million in sales, sells in U.S. and Canada

Okidata (Mt. Laurel, NJ): subsidiary of OKI Electric of Japan Ltd.

Printek (Benton Harbor, MI): 75 employees, $5-10 million in sales, sells nationwide and internationally

Printronix (Irvine, CA): 1750 employees, $50+ million in sales, sells nationally and internationally

QMS Inc. (Mobile, AL): 300 employees, $20-50 million in sales, sales concentration in home office area

Ricoh Corp. (W. Caldwell, NJ): 2500 employees, $50+ million in sales, sales concentrated in home office area

SEA Inc. (Carmel, IN): 75 employees, $10-19 million in sales, sells in midwest U.S.

Siemens Information Systems (Boca Raton, FL): 405 employees, sells through worldwide dealers

Shinwa of America (Morton Grove, IL): sales concentrated in home office area

Silver-Reed America (Torrance, CA): 60 employees, $50+ million in sales, sells nationwide U.S. and Canada

Star Micronics America (New York, NY): 100 employees, $50+ million in sales, sells nationwide

Talaris Systems (San Diego, CA): 92 employees, $10-19 million in sales, sells primarily in Boston, Chicago, San Diego, San Jose, NY areas

Toshiba America (Tustin, CA): 60 employees, $50+ million in sales, sells primarily in Irvine, CA, St. Louis, Washington, DC, Parsippany, NJ areas

SOURCE: **The Datapro Research Corp., March 1987 Report**

More detailed information for several computer printer manufacturers follows...............

DATAPRODUCTS CORP.

Dataproducts is the leading independent manufacturer of printers for the data processing industry. The company supplies most major computer makers, and produces telecommunications equipment as well, primarily for government markets. Dataproducts has plants in Connecticut, California, New Hampshire, Ireland, and Hong Kong. The firm's R & D expenditures represent 6.6% of sales, and it employs 3,900 people.

No printer manufacturer has a broader line than Dataproducts. It offers products, technologies, and price/performance levels for most any application. Value Line reports that it is likely too that Dataproducts' line is so broad as too inhibit profitability. For example, the recent acquisition of of the remaining 50% share of the solid-ink joint venture brought with it the development of a liquid ink machine, a costly project which Dataproducts may abandon.

The firm has long been a strong seller to computer producers, which in turn sell computer systems (including their own processors and Dataproducts printers) to users. Computer marketing is falling increasingly into the hands of value-added resellers. Therefore, Dataproducts is forging closer ties to some 500-600 value-added resellers. This new and improved marketing effort has been headed by a former Wang Labs executive.

Investment analysts feel that the firm's earnings will probably remain depressed for a while, due to start-up costs associated with the solid-ink printers, extra expenses tied to the former joint venture, and expanded marketing efforts. Following is a seven-year financial analysis of the company...............

	1982	1983	1984	1985	1986	1987	1988 E
				($ Millions)			
SALES	$295.1	$398.6	$471.8	$353.8	$338.8	$320	$355
NET PROFIT ($)	13.7	26.0	27.7	4.2	9.0	(3.0)	15.0
NET PROF. MARGIN (%)	4.6	6.5	5.9	1.2	2.7	---	4.2

GENICOM CORP.

Genicom (Waynesboro, VA), once a subsidiary of General Electric, has been independent since 1983. In the last quarter of 1986, the firm announced that it had reached an agreement to buy the printer-related assets of Centronics Data Computer Corp., as well as an agreement to purchase a portion or all of the assets of a service firm called Momentum Technologies Inc., and TeleVideo Systems Inc.

Genicom's lines include the 10 ppm 5010 laser printers, several lines of impact printers made by Copal, the 2000 series of teleprinters, and a 3000 series of dot matrix models. The 3000 series has become the core of the company's printer line. Genicom has a long track record of experience with non-impact technologies, although profits have lagged.

In 1983, GE announced that it had sold its Data Communications Products Business Business Department to a DCPBD management group, creating Genicom. The company upgraded its products, expanded dealer/distributor sales, created a European subsidiary, and hired new marketing and sales execs from competitors such as Okidata, Dataproducts and Qume.

Genicom had fiscal 1986 sales of $114 million, up nearly 21% from 1985. In June 1986 Genicom went public. The firm's printers are sold through its own sales force and service arm--GEISCO. In addition, the company has a very good OEM and dealer/distributor program. Genicom maintains U.S.-based manufacturing facilities in Waynesboro, VA and Reynosa, Mexico.

MANNESMANN TALLY CORP.

Mannesmann Tally (Kent, WA) was known as a maker of serial and line dot matrix printers, but like others, moved into the rapidly-growing page printer market by introducing its MT910s laser printer. As it tests new areas, its first concern still lies with impact dot matrix models. Tally phased out many older models and has remained competitive by introducing new printers to the market. One goal of the firm has been to strengthen its distribution network.

Outside of the Northwestern U.S. Mannesmann makes its prroducts available to dealers via regional distributors. The firm also continues its traditional concentration on OEM and VAR sales. Serial dot-matrix printers still dominate Tally's product line.

The company was formed in 1979 by the merger of the printer interests of Tally Corp., Potter Instruments GmbH, and Mannesmann Prazisiontechnik GmbH, a subsidiary of Germany's Mannesmann AG. Tally Corp., after resisting a takeover effort by one of its major customers (Pertec) was renamed Mannesmann Tally as it became a wholly owned subsidairy of Mannesmann AG. Mannesmann AG claims to be one of the 60 largest corporations in the world, and is based in Germany.

Mannesmann has manufacturing facilities in Kent, WA; Ulm, W. Germany; and Vienna, Austria. Traditionally devoted to the production of matrix serial and line printers, Mannesmann Tally is now committed to non-impact printers.

PRINTRONIX, INC.

Printronix is said to be the industry's leading supplier of dot matrix line printers, and has been dominant in the industry almost since its founding. The company also sells full-character printers via the acquisition of Data Printer Corp. in 1984. Also in 1984, Anadex announced that it agreed to be acquired by Printronix, in a stock deal valued at about $8 million. In late 1985, Printronix closed its Anadex manufacturing plant in Camarillo, CA and reduced its Boston operation. It then opened a new facility in Singapore, which now makes the MVP series printers.

In June 1986 Printonix introduced 11 new line printers and two new page and bar code printers--aimed at the personal computer market. Printronix' traditional distribution channels include OEM sales. Its remarketers include DEC, Prine, TI, Basic Four, and Tandy/Radio Shack. During the 1986 fiscal year, a net loss of $12 million was incurred, on sales of $132 million. This followed a $7 million net income figure for 1985. Printronix was founded in 1974 by Bob Kleist, a founder of Pertec. It is publicly owned and is traded OTC.

SELECTED COMPUTER PRINTER TRADE ASSOCIATIONS, RELATED ORGANIZATIONS, AND PERIODICALS

Associated Minicomputer Dealers of America
P.O. Box 627
Ft. Worth, TX 76101
(817-531-1371) (William T. Ewell, Exec. Sec.)

Association of Minicomputer Users
Two Frederick St.
Framingham, MA 01701
(617-879-5955) (Raymond P. Wenig, Exec. Dir.)

Association of Computer Users
P.O. Box 9003
Boulder, CO 80301
(303-443-3600) (Mr. Hillel Segal, Pres.)

CAP International, Inc.
One Snow Road
Marshfield, MA 02050
(617-837-1341) * Sponsors Electronic Printer & Publishing Conference

Computer & Business Equipment Mfrs. Association (CBEMA)
311 First St. N.W., 5th Fl.
Washington, DC 20001
(202-737-8888) (Vico E. Henriques, Pres.)
* Industry surveys, reports, marketing statistics, foreign trade reports

Computer Graphics Co. (David Small)
8300 Greensboro Drive
Suite 1110
McLean, VA 22102
(212-216-2291) * Sponsors annual Computer Graphics Show

Datek Information Services (Cap International company)
P.O. Box 68
Newtonville, MA 02160
(617-893-9130) * Publishes PRINTOUT ANNUAL, directories, surveys,
newsletters, databases related to electronic imaging industry

Institute For Graphics Communications (Richard Murray, Pres.)
375 Commonwealth Ave.
Boston, NA 02115
(617-267-9425) * Sponsors annual Electronic Impact Printers Conference

National Computer Graphics Association
2722 Merrilee Dr., Suite 200
Fairfax, VA 22031
(703-698-9600) (James S. Werking, Gen. Mgr.)

Printing Industries of America
1730 N. Lynn St.
Arlington, VA 22209
(703-841-8100) (G. William Teare Jr., Pres.)

World Computer Graphics Association
2033 M St., Suite 399
Washington, DC 20036
(202-775-9556) (Caby Smith, Pres.)

PERIODICALS

Computer Dealer
Philos Publications Inc.
1 E. Chase St.
Baltimore, MD 21202 (201-361-9060) circulation: 45,000

Computer Graphics
Assn. for Computing Machinery
11 W. 42nd St.
New York, NY 10036 (212-869-7440) circ. 5,000

Computer Graphics News
Sherago Associates Inc.
1515 Broadway
New York, NY 10036 (212-730-1050) circ. 29,000

Computer Graphics Today
Media Horizons Inc.
50 W. 23 St.
New York, NY 10010 (212-645-1000) circ. 23,200

THE COMPUTER PRINTER & PLOTTER MARKET

LIST OF COMPUTER PRINTER MANUFACTURERS, BY TYPE PRINTER (1986)

COMPANY	TYPE PRINTERS SOLD
AEDEX	laser
AXONIX	dot matrix, thermal
BEEHIVE INTERNATIONAL	dot matrix
C. ITOH ELECTRONICS	dot matrix, formed character, thermal
CENTRONICS DATA COMPUTER	dot matrix, formed char., laser
CITIZEN AMERICA	dot matrix, formed char.
COMPUTER CONNECTION	dot matrix
COMPUTER PRODS./MEMODYNE	thermal
COMPUTER TRANSCEIVER SYSTEMS	dot matrix, thermal
COMSTAT DATACOMM	laser
DAISY SYSTEMS HOLLAND BV	formed char.
DATA PRINTER	formed char., laser
DATAPRODUCTS	formed char., laser
DATEL/GENERAL ELECTRIC	dot matrix
EPSON AMERICA/OEM DIV.	dot matrix, formed char., ink jet,thermal
FUJITSU AMERICA/STORAGE DIV.	dot matrix, laser
GENICOM	dot matrix, laser
GENSTAR RENTAL ELECTRONICS	dot matrix, ink jet
GULTON INDUSTRIES/GRAPHICS DIV.	thermal
HETRA COMPUTER & COMM. IND.	formed char., laser
KIPP & ZONEN	thermal
MAI BASIC FOUR	dot matrix, formed char.
MESA TECHNOLOGY	dot matrix
MANNESMANN TALLY	dot matrix, laser
MILTOPE	dot matrix, laser, thermal
MITSUBISHI ELECTRONICS AMERICA	thermal
MODULAR COMPUTER SYSTEMS	dot matrix, formed char.
MONARCH MARKING SYSTEMS	thermal
NEC INFORMATION SYSTEMS	dot matrix, formed char.
NEWPORT ELECTRONICS	thermal
NISSHO INFORMATION SYSTEMS	dot matrix
PERICOM	dot matrix, thermal

Table continued............

THE COMPUTER PRINTER & PLOTTER MARKET

LIST OF COMPUTER PRINTER MANUFACTURERS, BY TYPE PRINTER (1986)

Table Continued..........

COMPANY	TYPE PRINTER SOLD
PRINTEK	dot matrix
PRINTER PRODUCTS	dot matrix
PRINTRONIX	formed character, laser
QMS	thermal
RICOH	formed char., laser
SCI SYSTEMS	ink jet
SEA	dot matrix, formed char.
SHINWA OF AMERICA	dot matrix
SILVER-REED AMERICA	formed char.
SPERRY	dot matrix, formed char., laser
SPUR PRODUCTS	formed char., laser
STAR MICRONICS	dot matrix
STARNETICS	dot matrix
SYNTEST	dot matrix, thermal
SYSTEM INDUSTRIES	formed char.
TALARIS SYSTEMS	laser
TELEVIDEO SYSTEMS	formed char.
TESSERA SYSTEMS	dot matrix
THE LYNK CORP.	dot matrix
TOSHIBA AMERICA	dot matrix
TRIAD MICROSYSTEMS	dot matrix, ink jet
TRICOM	dot matrix, formed char., ink jet,laser
ULTIMATE COMPUTER SUPPLIES	dot matrix, formed char., ink jet, laser
VT	dot matrix
WIN INDUSTRIAL SALES	dot matrix, formed char.
ZIYAD	formed char.

SOURCE: 1986 Electronic Buyers News Handbook & Directory

COMPUTER PRINTER SUPPLIERS--DOT MATRIX TYPE
BY MODEL NUMBER & PRICE

COMPANY	MODELS PRODUCED	PRICE
ALPHACOM	AERO	$249
APPLE	IMAGEWRITER	595
AT & T	477, 478	1695, 985
BROTHER	M-1409, M1509	479
BROTHER	2024L	1295
CANON	A-60	649
CENTRONICS	358 PRINTSTATION	2895
CITIZEN AMERICA	120D, MSP-15	269, 599
C. ITOH	C-310 XP, C-315 XP	649, 819
C. ITOH	PROWRITER C-17 RELIANT	1295
DATA GENERAL	6215	2950
DATAPOINT	9623	2400
DATAPRODUCTS	8070	1999
DATASOUTH COMPUTER	DS 220	1695
DIGITAL MATRIX	FORM WRITER 9/132	1270
DYNAX	DM 2015	559
EPSON	LQ-2500	1595
FACIT	3350	1295
FLORIDA DATA	300	3495
FUJITSU AMERICA	DX2100, 2400	545, 1195
GENERAL BUS. TECHNOL.	5227FA	1995
GENICOM	1000-1025	699
HERMES	616 PROFESSIONAL	2800
HEWLETT-PACKARD	2934-A	3995
IBM	QUIETWRITER II	1595
IMTEC	7000	3995
INFOSCRIBE	1000, 143X	1390, 3198
JUKI	5510-C	650
MOTOROLA	PT 235	1450
NEC	PINWRITER P5XL	1695
OKIDATA	MICROLINE 292, 182	749, 399
OKIDATA	MICROLINE 294, 2410	1499, 2395

CONTINUED.........................

DOT MATRIX COMPUTER PRINTER SUPPLIERS (Continued)
BY MODEL & PRICE

COMPANY	MODELS PRODUCED	PRICE
OLIVETTI	DM280	595
OLYMPIA	NP 80, NP 136	549, 699
OUTPUT TECHNOL.	700-E	1995
PANASONIC	KX-P1595, KX-P1092	949, 499
PANASONIC	KX-P1080	319
PHILLIPS INFO. SYS.	GP-300	2690
PRINTONIX	PERSONAL LINE PRINTER	795
SPERRY	115, 5	695, 324
STAR MICRONICS	NB-15	1449
TAB	M-184, M24P/M25S	1095, 695
TAB	M22P/M23S, M20P/M21S	499, 299
TANDY	DMP/430	899
TELEX COMPUTER PRODS.	387	6000
TEXAS INSTRUMENTS	880 AT	2195
TOSHIBA	P351C, P341E	1749, 999
TOSHIBA	P321	699
WANG	5577	5975
XEROX	COMPANION 34LQ	1399

DAISYWHEEL PRINTERS

ALPHACOM	ALPHA PRO 101	499
APROTEK	1120	749
AT & T	455	1049
BROTHER	HR-20, HR-25	599, 1449
BROTHER	HR-35	999
CITIZEN AMERICA	PREMIERE 35	2695
C. ITOH	F10-55, D10-40	2400, 2495
DATA GENERAL	6321	499
DATAPOINT	9611/1261	899
DATA PRODUCTS	DB 55 SQ	695
DYNAX	DX21	1495
EPSON	35	3695

Continued............................

DAISYWHEEL PRINTER SUPPLIERS (Continued)
BY MODEL & PRICE

COMPANY	MODELS PRODUCED	PRICE
FACIT	D-2000	1995
FUJITSU AMERICA	SP 320 E	1395
GENERAL BUS. TECH.	5206 WP	1695
HARRIS-LANIER	1600L	1899
JUKI	6500	549
NEC	8850	659
OLIVETTI	DY 800	419
OLYMPIA	ESW 1000	1690
PANASONIC	KX-P3151	1895
PANASONIC	KX-P3131	1995
PHILLIPS INFO. SYS.	P-40	995
PRIMAGES	100	599
QUME	SPRINT 1190	449
RICOH	RP3400Q	300
ROYAL BUS. MACHINES	OFFICE MASTER 2000	949
SANYO	PR 5200	400
SILVER REED	EXP 420, EXP 600	280, 1995
SONY	2440	$1795.0
SPERRY	21, 31	695, 2100
STAR MICRONICS	Powertype	499
TELEX COMPUTER	286-F	5750
XEROX	Diablo Adv D80, 635, Adv D25	2195, 1485, 745
INKJET		
CANON	PJ-1080A	$699.0
DICONIX	150	479
SIEMENS INFO. SYS.	PT 88, PT 89	699, 849
STAR MICRONICS	STX-80	199
TELEX COMPUTER	851	750
XEROX	4020	1495

SOURCE: ADMINISTRATIVE MANAGEMENT MAGAZINE, OCT. 1986

PRINTER MANUFACTURERS, BY TYPE PRINTER

SERIAL PRINTER UP TO 100 CPS

A. B. Dick
Advanced Communications
Alphacom
Apple Computer
Astronautics
Atari
BDS
Billings Computer
Braegen
Burroughs
CAB-TEK
Campbell Scientific
Canon
Capitol Circuits
Commodore Business Machines
Compucorp
Computer Devices
Computer Terminal Systems
Computers International
Computone Systems
Control Data
Coosol
Cromemco
Data General
Data Machines International
Datamaxx USA
Datapoint
Dataproducts
Diablo Systems
Digital Associates
Digital Equipment
Digitec
Digitex
DIP, Inc.
DYNAX
Eaton
Epson America
Ergotron
EXXON Office Systems
Facit/Dataroyal
Forte Technology
Fujitsu
General Business Technology
Hewlett-Packard
HI-G
Honeywell Information Systems
IBM
Intek Manufacturing
Interface Mechanisms
Interface Systems
Irwin Olivetti
C. Itoh Electronics
ITT Systems
Juki Industries
Leading Edge Products
MDS Qantel
Memodyne
Memorex
Mepcom International
Microdata
Mohawk Data Sciences
Monolithic Systems
MPI (Micro Peripherals)
NCR Corporation
NEC Information Systems
Okidata
Olympia U.S.A.
Pansonic Industrial
Perkin-Elmer
Plessey Peripheral Systems
Primages
Printer Systems
Q1 Corporation
Quality Micro Systems
Qume
Qytel
Radio Shack
Raytheon
Ricoh
Rochester Data
Sanyo Business System
Scanmark Division of Electroprint
Selectone
Sciences Communications
Silver-Reed
Smith-Corona
Sony
Sperry
Sperry VinVac
Star Micronics
Syntest
Tang Data
Tektronix
Teletex Communications

PRINTER MANUFACTURERS, BY TYPE PRINTER

(CONTINUED)

SERIAL PRINTER UP TO 100 CPS (CON'T)

Televideo Systems
Telex Computer Products
Texas Instruments
Transtar
Trendcom
Tymshare
Vector Graphic
Victor Data Products
Wang Labs
Xerox Printing Systems

SERIAL PRINTER UP TO 200 CPS

Anacom General
Anadex
Anderson Jacobsen
Antex Data Systems
Apple Computer
Axiom
Beehive
Billings Computer
Braegen
Cab-Tek
Canon Capitol Circuits
Carterfone Communications
Centronics
Commodore Business Machine
Computer Automatron
Computer Communications
Computer Terminal Systems
Computer Transceiver Systems
Control Data
Coosol
Cromenco
Data General
Data Terminals & Communications
Datapoint
Dataproducts
Datasouth Computer
Decision Data
Delta Data Systems
Dennisin Manufacturing
DI-AN Controls
Digital Associates
Digital Equipment
Digitex
DIP, Inc.
DP-Tek
Envision
Epson America
Ergotron
Facit/Dataroyal
John Fluke Manufacturing
General Business Technology
GE
Hewlett-Packard
HI-G
Honeywell Information Systems
IBM
Infoscribe
Integral Data Systems
Integrex
Integ
Interface Systems
Intersil Systems
C. Itoh Electronics
ITT Systems
Leading Edge Products
Lear Siegler
Mannesmann Tally
MDS Qantel
MDS Trivex
Memorex
Microdata
Microprocessor Systems
Mohawk Data Sciences
Motorola
Micro Peripherals
North Atlantic Industries
Okidata
Panasonic Industrial
Perkin-Elmer
Personal Micro Computers
Plessey Peripheral Systems
Printer Systems
Ql Corp.
Racal-Milgo
Radio Shack
Siemens Communications
Southern Systems

PRINTER MANUFACTURERS, BY TYPE PRINTER

(CONTINUED)

SERIAL PRINTER UP TO 200 CPS (CON'T)

- Sperry
- Syntest
- Tab Products
- Telecom Terminal Systems
- Telex Computer Products
- Texas Instruments
- Toshiba
- Tymshare
- Wang Labs
- Westrex
- WICAT Systems
- Zenith Data Systems

SERIAL PRINTER UP TO 300 CPS

- Amperex Electronic
- Anadex
- Burroughs
- Computer Printers International
- Datasouth Computer
- DI-AN Controls
- Digital Equipment
- Envision
- Ergotron
- Facit/Dataroyal
- GE
- ITT Systems
- Radio Shack
- Scientific Software & Insts.
- Sperry
- Wang Labs
- Zentec

SERIAL PRINTER UP TO 600 CPS

- Braegen
- Computer Terminal Systems
- Dataproducts
- DI-AN Controls
- Digital Associates
- Facit/Dataroyal
- Florida Data
- General Business Technology
- GE
- IBM
- Infoscribe
- Mannesmann Tally
- Okidata
- Printer Systems
- Tandem Computers
- Teletronix
- Teletype
- Vector Graphic
- Zentec

SERIAL PRINTER OVER 600 CPS

- SCI Systems

LINE PRINTER UP TO 200 LPM

- Addmaster
- Astronautics
- Burroughs
- Computer Enhancement
- Control Data
- Digitec
- DP-Tek
- John Fluke Manufacturing
- Honeywell Info. Systems
- IBM
- Kaye Instruments
- Keithley Insts.
- Mannesmann Tally
- Microdata
- NCR Corp.
- Newport Electronics
- Prime
- Printronix
- Qytel
- Ramtek
- Standard Logic
- Trilog
- Wang Labs
- Weber Marketing Systems

PRINTER MANUFACTURERS, BY TYPE PRINTER

(CONTINUED)

LINE PRINTER UP TO 300 LPM

Ampax Business Systems
BDS
Burroughs
Computer Automation
Computer Designed Systems
Computer Enhancement
Computer Talk
Data Engineering
Data General
Datapoint
Decision Data
Digital Equipment
Digitex
Ecotran
HMW Enterprises
Honeywell Info. Systems
IBM
Innovative Electronics
Interface Systems
Irwin Olivetti
C. Itoh Electronics
Local Data
Mannesmann Tally
MDS Qantel
Microdata
Miltope
Mohawk Data Sciences
NCR Corp.
NEC Info. Systems
Perkin-Elmer
Plessey Peripheral Systems
Prime
Printer Systems
Printronix
Q1 Corp.
Qytel
Racal-Milgo
Rockwell International
Southern Systems
Sperry
Stratus Computer
Technical Analysis
Teletype
Texas Instruments
Trilog
Wallace Computer Services
Wang Labs
Weber Marking Systems

LINE PRINTER UP TO 600 LPM

Astronautics
BDS
Braegen
Burroughs
Centronics
Computer Automation
Computer Designed Systems
Computer Enhancement
Control Data
Data Engineering
Data General
Data Specialties
Datadyne
Datapoint
Dataproducts
Digital Associates
Digital Equipment
Digitex
EMC
General Business Technology
GE
Hewlett-Packard
Honeywell Info. Systems
IBM
Intersil Systems
ITT Systems
Local Data
MDS Qantel
Memorex
Microdata
Mohawk Data Sciences
NEC Information Systems
Perkin-Elmer
Plessey Peripheral Systems
Potter Instrument
Prime
Printer Systems
Printronix
Southern Systems

PRINTER MANUFACTURERS, BY TYPE PRINTER

(CONTINUED)

LINE PRINTER UP TO 600 LPM (CON'T)

Sperry
Stratus Computer
Tandem Computers
Teletype
Texas Instruments
Wallace Computer Services
Wang Labs

LINE PRINTER UP TO 1,000 LPM

Ampax Business Systems
BDS
Burroughs
Computer Terminal Systems
Control Data
Data Engineering
Data General
Data Printer
Datapoint
Dataproducts
Decision Data
Digital Associates
Digital Equipment
EMC
General Business Technology
Honeywell Info. Systems
Houston Instrument
IBM
Prime
Printer Systems
Southern Systems
Sperry
Stratus Computer
Tandem Computers

LINE PRINTER OVER 1,000 LPM

BDS
Braegen
Burroughs
Centronics
Computer Maintenance Tech.
Control Data
Cynthia Peripheral
Data Engineering
Data General
Data Printer
Datadyne
Datametrics
[illegible]apoint
[illegible]aproducts
Decision Data
Digital Associates
Digital Equipment
EMC
Four-Phase Systems
General Business Technology
Honeywell Info. Systems
IBM
NCR Corp.
Printer Systems
Renaissance Marketing
Scanmark Div. of Electroprint
Southern Systems
Sperry
Storage Technology

PAGE/LASER PRINTER

Burroughs
Combur
Datagraphix
General Business Technology
General Optronics
Hewlett-Packard
Honeywell Info. Systems
IBM
Imagen
Quality Micro Systems
Renaissance Marketing
Ricoh
Royal Business Machines
SCI Systems
Southern Systems
Sperry Univac
Three Rivers Computer
Wang Labs
Xerox-Printing Systems

PRINTER MANUFACTURERS, BY TYPE PRINTER

(CONTINUED)

PRINTER/PLOTTER UP TO 100 CPS

- Alphacom
- Axiom
- Data Terminals & Commun.
- Digitec
- EPIC Computer
- Victor Data Products

PRINTER/PLOTTER UP TO 200 CPS

- Alphacom
- Axiom
- Hewlett-Packard

PRINTER/PLOTTER UP TO 600 CPS

- Alphacom
- Information Devices

PRINTER/PLOTTER UP TO 200 LPM

- Control Data
- Datametrics
- Racal-Dana Instruments
- Trilog

PRINTER/PLOTTER UP TO 300 LPM

- Datametrics
- Digital Equipment
- Miltope
- Prime
- Sigma Systems
- Trilog

PRINTER/PLOTTER UP TO 600 LPM

- Computer Designed Systems
- Digital Equipment
- Miltope
- Synemed

PRINTER/PLOTTER UP TO 1,000 LPM

- Miltope
- Versatec

SOURCE: DATA SOURCES

MAJOR COMPUTER PRINTER & PLOTTER MANUFACTURERS

Company Name	Street		City	State	Zip
A T & T Teletype Corp.	555 Touhy Ave.		Skokie	IL	60077
ALPS America	3553 North First St.		San Jose	CA	95134
Brother International Corp.	8 Corporate Place		Piscataway	NJ	08854
C. Itoh Electronics, Inc.	19300 So. Hamilton Ave.		Torrance	CA	90248
Canon USA, Inc.	One Canon Plaza		Lake Success	NY	11042
Centronics Data Computer Corp.	One Wall St.		Hudson	NH	03051
Citizen America Corp.	2425 Colorado Ave.	Suite 300	Santa Monica	CA	90904
Dataproducts Corp.	6200 Canoga Ave.	P.O. Box 746	Woodland Hills	CA	91365-0746
Datasouth Computer Corp.	4216 Stuart Andrew Blvd.		Charlotte	NC	28210
Delphax Systems	35 Pacella Park Dr.		Randolph	MA	02368
Diconix, Inc.	3100 Research Blvd.		Dayton	OH	45420
Digital Equipment Corp.	146 Main St.		Maynard	MA	01754-2571
Epson America, Inc.	2780 Lomita Blvd.		Torrance	CA	90505
FACIT, Inc.	Nine Executive Park Dr.	P.O. Box 334	Merrimack	NH	03054
Fujitsu America	Peripheral Prods. Div.	3055 Orchard Dr.	San Jose	CA	95134-2017
Genicom Corp.	1 Genicom Drive		Waynesboro	VA	22980
Hewlett-Packard Corp.	1820 Embarcadero Rd.		Palo Alto	CA	94303
Hitachi America, Inc.	59 Route 17 South		Allendale	NJ	07401
Honeywell Info. Systems	200 Smith St.		Waltham	MA	02154
I B M Corp.	Old Orchard Rd.		Armonk	NY	10504
Mannesmann Tally Corp.	8301 So. 180th St.		Kent	WA	98032
Milliken/Impression Prods.	P.O. Box 1926		Spartanburg	SC	29304
Minolta Corp.	101 William Dr.		Ramsey	NJ	07446
NEC Information Systems	1414 Massachusetts Ave.		Boxborough	MA	01719
Nissei Sangyo America	1701 Golf Rd.		Rolling Meadows	IL	60008
Namura Computer Systems	29, Yotsuya 4-chome	Shinjuku-ku	Tokyo 160	Japan	
Okidata Corp.	532 Fellowship Rd.		Mt. Laurel	NJ	08054
Printronix, Inc.	17500 Cartwright Rd.	P.O. Box 19559	Irvine	CA	92713
Ricoh Corp.	Peripheral Prods. Div.	5 Dedrick Pl.	W. Caldwell	NJ	07006
Sharp Electronics Corp.	Sharp Plaza		Mahwah	NJ	07430

MAJOR COMPUTER PRINTER & PLOTTER MFRS. (Continued)

Company Name	Street		City	State	Zip
Siemens-Info. Systems	Peripherals Div.	240 E. Palais Rd.	Anaheim	CA	92805
Silver Reed America	19600 So. Vermont Ave.		Torrance	CA	90502
Sperry Corp.	P.O. Box 500		Blue Bell	PA	19424-0015
Star Micronics, Inc.	200 Park Ave.	Suite 3510	New York	NY	10166
Storage Technology Corp.	2270 South 88th St.		Louisville	CO	80028-0001
Teijin America, Inc.	10 Rockefeller Plaza	Suite 1001	New York	NY	10020
Texas Instruments	Peripheral Products Div.	P.O. Box 6102	Temple	TX	76503-6102
Toshiba America	Info. Systems Div.	2441 Michelle Dr.	Tustin	CA	92680
Xerox Corp.	Printing Systems Div.	710 S. Aviation Blvd.	El Segundo	CA	90245